A new approach to investigate dividend smoothing: Theoretical and empirical evidence

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Abstract

The main purpose of this study is to use Lee et al.'s generalized dividend behavior model (1987) to re-examine whether previous dividend researches are appropriate. This study proposes a dividend smoothing model that integrates two prevailing dividend hypotheses to evaluate the degree of dividend smoothing behaviors and investigates cross-sectional variation in determining a firm's propensity to smooth dividend. By using a sample of 1,193 U.S. firms, our empirical analysis classifies firms' payout patterns into five different policies and suggests that 54% of observed dividend behavior among U.S. firms is attributable to signaling incentive. Furthermore, this study decomposes dividend smoothing behaviors through two channels: (1) lagging channel (via speed of partial adjustment, SOA) and (2) leading or signaling channel (via earnings expectation coefficient). Our findings show that firms with a stronger monitoring mechanism or are subject to more agency conflicts will smooth dividend more through partial adjustment channel. Also, firms subject to higher information asymmetry or lower growth opportunity will smooth dividend more through the signaling-incentive channel.

In this paper, we propose four future research issues to be done. Especially, we argue that Lambrecht &Myers's theoretical model (2012) which only use partial adjustment model may not be the most appropriate dividend behavior model. Therefore, we will re-examine their theoretical results in term of adaptive expectation model.

Keywords: dividend smoothing; speed of partial adjustment; earnings expectation coefficient

JEL: D22, G32, G35.

1. Introduction

Dividend smoothing behavior has been well-documented in corporate finance for decades, but there is surprisingly little consensus on the debate of explaining dividend smoothing from two different prevailing views: the partial adjustment and information content hypothesis. Accordingly, the partial adjustment hypothesis (Lintner, 1956) states that firms' managers tend to set a long-run target payout ratio and adjust their dividends gradually through a speed of adjustment toward the desired level. Therefore, firms gradually adjust their dividend to a given change in earnings over time; consequently, dividends tend to lag behind earnings. In contrast, information content hypothesis (Fama and Babiak, 1968; Nissim, D., and A. Ziv, 2001) suggests that firms attempt to convey managerial expectations of long-term earnings via dividend policy; consequently, dividend leads earnings. Given the different nature of the hypotheses, the empirical evidence presents a challenge for developing measures to capture dividend smoothing behavior across different motives (Leary and Michaely, 2011).

A recent empirical work from Leary and Michaely (2011) shows evidence supporting agency-based explanations for dividend smoothing behavior derived from partial adjustment process (Lintner, 1956). However, we argue that it is difficult to distinguish alternative hypotheses by using regression analysis based on the partial adjustment model alone. Recall that Lintner's model suggests a firm follows a speed of adjustment in its dividend payout in response to a given change in current earnings; consequently, dividends lag behind earnings. Now, if the firm attempts to convey information to the market via dividend payout policy, it is generally suggested that the change in dividend signals the change in expected long-term earnings. In other words, we argue that any dividend change can be defined as a product of the speed of partial adjustment, change in expected long-term earnings or a combination of both from alternative hypotheses views. Therefore, given these implied differences, we argue that a dividend smoothing empirical model to test an alternative hypothesis should provide measures for dividend smoothing from partial adjustment and change in earnings expectation, respectively. In addition, while the recent theoretical literature has shown a renewed interest in explaining dividend smoothing (Wu, 2017), we highlight the importance of measuring the degree of dividend smoothing to better explain cross-sectional properties for future empirical studies.

In this study, we attempt to develop a general empirical model that integrates two alternative dividend smoothing hypotheses to evaluate dividend smoothing behaviors and contribute our understanding of what determines a firm's propensity to smooth dividend. Compared with the most common measures of dividend smoothing used in the literature based on Lintner's model (1956), the proposed model in this study is motivated by Lee et al. (1987). As the model can be used to evaluate whether the firm's decision follows either a partial adjustment process or adaptive expectation, we believe it provides a more flexible framework for examining the determination of dividend smoothing to the growing theoretical literature. Based on the empirical estimates of the model parameters with Marquardt's non-linear regression method by using 1,193 U.S. firms in our analysis, we show that dividend behavior can be classified into five dividend payout policies: (1) integrated (14.6%), (2) partial adjustment (9.8%), (3) adaptive expectation (54%), (4) Myopic (6.2%), and (5) Residual (15.4%) model. In other words, the results suggest that 54% of observed dividend payout behaviors among U.S. firms are driven by signaling incentive. Meanwhile, our findings show that firms following the residual policy are younger, with less free cash and higher leverage in contrast to integrated policy.

Furthermore, we motivate our empirical analysis by investigating what determines a firm's propensity to smooth dividend according to existing market frictions. We decompose dividend smoothing behavior through two drivers: (1) speed of adjustment (SOA, λ) that serves as a lagging channel of dividend smoothing and (2) earnings expectation coefficient (δ) that serves as a leading channel of dividend smoothing. Our findings show that firms with greater size, age, and institutional shareholding and firms with more analysts following and less forecasting deviation or stock turnover have lower SOA (λ), which leads to more dividend smoothing. The results suggest firms with monitoring mechanisms smooth more through partial adjustment channel. In sum, these findings support the notion that agency-based factors better explain SOA (Leary and Michaely, 2011). In addition, our findings show that firms with greater institutional shareholding, forecasting deviation or lower market to book ratio have a lower earning expectation coefficient (δ) that leads to more dividend smoothing. The results indicate that firms subject to higher information asymmetry or lower growth opportunity will smooth dividend more through signaling-incentive channel. Finally, in order to examine the prevalence of dividend smoothing varying over time, we estimate annual dividend smoothing measures (λ, δ) for each firm by using an 11-year rolling period individually. The results suggest an increased tendency of dividend smoothing over time from 1998 through 2016 with a decreased earnings expectation coefficient. Overall, our integrated model better explains alternative dividend smoothing hypotheses and contributes to the measure of dividend smoothing in future empirical studies.

In this paper, we make two main contributions to empirical corporate finance literature. First, we disentangle leading channel versus lagging channel to smoothing dividends and analyze their implications on a firm's payout policy. The implication is particularly interesting since partial adjustment and information content incentives are not necessary to contradict each other.

Therefore, we add to the literature by demonstrating the integrated model with Marquardt's nonlinear least squares regression model helping to capture dividend smoothing behavior. Second, we document cross-sectional variation in dividend smoothing by showing that agency-based and information asymmetry proxies are associated with dividend smoothing through different channels. These findings contribute to the determinants of dividend smoothing in the empirical study.

The rest of this study is organized as follows. Section 2 discusses related literature and develops our research method and estimation procedure for dividend smoothing. Section 3 presents sample selection and descriptive statistics of dividend smoothing measure. Section 4 and 5 present our cross-sectional empirical result and robustness checks in determining dividend smoothing behavior, respectively. Finally, Section 6 is our conclusion.

2.1 Literature Review on Dividend Smoothing

Dividend smoothing which indicates that firms are primarily concerned with the stability of dividends is first observed by Lintner (1956). According to Lintner's model, the process of pursuing a stable dividend payout stream is referred to as firms' managers tend to set a long-run target payout ratio and adjust their dividends gradually through a speed of adjustment toward the desired level. While Lintner's work was done over 60 years ago, his findings of dividend smoothing behavior seem to prevail over the decades. For instance, Brav et al. (2005) survey 166 financial executives and find that 93.8% of managers express a strong desire to avoid dividend cuts. Guttman et al. (2007) find that firms have a partially pooling dividend policy, in other words, the same dividend is announced for a range of different earnings realizations and unless earnings fall outside of the interval, the dividends are not changed. Meanwhile, along with dividend smoothing behavior, a continuous debate of why firms smooth their dividends from two different prevailing views: (1) information asymmetry or (2) agency cost remains an opening empirical issue.

From the perspective of information asymmetry, dividend policy is regarded as a means of private information communication for future prospect initiated by managers. There is well-documented evidence supporting this view in literature. For instance, Woolridge (1983), Handjinicolaou & Kalay (1984), and Benartzi et al. (1997) find that when a company announces a positive dividend change, a positive abnormal return for common stock, preferred stock, and bonds occurs. In other words, both bondholders and stockholders interpret dividend increases as signals of higher future performance. Yoon and Starks (1995) find that dividend increases (decreases) are associated with subsequent significant increases (decreases) in capital expenditures over the three years following the dividend change. Grullon et al. (2002) document that dividend-increasing firms experience a significant decline in their systematic risk and increase in price over the next three years. Ofer and Siegel (1987) provide evidence that analysts revise their earnings prediction following an unexpected dividend change. Healy and Palepu (1988) find a positive relationship between the initiation of dividend and earnings. Officer (2011) shows a positive stock return after dividend initiation due to positive expected future profitability. In a recent study, Floyd et al. (2015) document that banks are reluctant to cut dividend to signal financial strength during a financial crisis. In sum, the above evidence suggests that dividend policy has information content for a firm's future prospect. In a recent work, by using an event window approach, Ham et al. (2019) show that dividend announcement returns reflect information about the level of permanent earnings.

From the perspective of an agency problem, dividend smoothing policy serves a role of mitigating agency conflict of cash flow. Easterbrook (1984) and Jensen (1986) suggest that a continuous and high level of dividend payout leads firms to raise external capital for financial need. Therefore, managers would be more disciplined in choosing investment projects that lead to a decreased agency conflict. Allen, Bernardo, and Welch (2000) suggest that institutional shareholders and dividend smoothing are alternative mechanisms for controlling agency cost. In addition, they argue that firms are motivated to smooth dividend as institutional shareholders have the ability to impose penalties if firms cut dividend. By using partial adjustment model, Lambrecht and Myers's theoretical model (2012) suggests that dividend payout is smoothed because managers want to smooth their flow of rents. Therefore, dividend payout smoothing follows from rent smoothing. However, their analysis using only partial adjustment model In sum, agency theory suggests firms more susceptive to agency conflicts smooth more.

2.2 The Integrated Model

In this section, we briefly compare the partial adjustment and adaptive expectation models with respect to their assumptions and implications on dividend policy. Then, by following Lee et al. (1987), we propose an integrated model that integrates the above models and discuss how the integrated model, which is compatible with two prevailing dividend smoothing hypotheses better explain dividend smoothing behavior.

The partial adjustment model proposed by Linter can be characterized as Equation (1) and (2).

$$\overline{D_t} = \gamma * E_t \tag{1}$$

$$D_t - D_{t-1} = \alpha + \lambda(\overline{D_t} - D_{t-1}) + \mu_t \tag{2}$$

Equation (1) states that a firm's desired dividend payment at t ($\overline{D_t}$) is a function of targeted long-term payout ratio (γ) and earnings at time t (E_t). Equation (2) assumes that the actual dividend payment at t (D_t) will only partially adjust from the starting position D_{t-1} to the desired position $\overline{D_t}$ in response to a given change in earnings at time t. The gap between actual and desired dividend depends on the speed of adjustment (SOA, λ). Thus, a change of dividends between time t and time t-1 would be equal to $\lambda(\overline{D_t} - D_{t-1})$ instead of $(\overline{D_t} - D_{t-1})$. The constant term α in Equation (2) was added by Lintner to stand for the firm's reluctance to cut dividends and is postulated to be positive. Finally, μ_t is the error term.

Substituting (1) into (2) yields

$$D_t - D_{t-1} = \alpha + \beta_1 D_{t-1} + \beta_2 E_t + \mu_t \qquad (3)$$

Where $\lambda = -\beta_1 \, and \, \gamma = -\beta_2 / \beta_1$

In this specification, speed of adjustment (λ) and target payout ratio (γ) are estimated in the regression. One of the implications for partial adjustment hypothesis indicates that dividend will tend to lag behind earnings as dividend payout gradually adjusts its dividend to a given change in the current earnings.

In contrast to the partial adjustment model, the adaptive expectation model hypothesizes that the current dividend is a function of expected long-run earnings. The relationship can be expressed as Equation (4).

$$D_t = \gamma * E_t^* + \varepsilon_t \qquad (4)$$

Equation (4) states that a firm's current dividend payment at t (D_t) is a function of targeted long-term payout ratio (γ) and expected long-run earnings at time t (E_t^*). ε_t is an error term. Thus, current dividends can be decomposed into the permanent component (γE_t^*) and the transitory component (ε_t). As E_t^* is unobservable and needs to be specified, a common version of the formation of earnings expectation (Nerlove, 1956; Ball and Watts, 1976) can be formulated as follows.

$$E_t^* - E_{t-1}^* = \delta(E_t - E_{t-1}^*) \tag{5}$$

Where E_t^*, E_{t-1}^* and E_t are current t period's expected earnings, previous period's expected earnings and current earnings respectively. δ is the profit expectation coefficient. We denote that earnings expectation coefficient (δ) is the proportion of the current change in earnings taken to be permanent rather than transitory. In other words, if earnings drop and the firm does not cut its dividends (or cut relatively less), the firm is trying to signal that the earnings decrease is just temporary. Therefore, the magnitude of managerial revision on expected long-run earnings depends on the size of δ where a high δ conveys a greater substantial adjustment in expectations. In contrast to partial adjustment model assuming that firm would gradually adjust its dividend toward to given desirable level (dividends tend to lag behind earnings), adaptive expectation model arguing that firm convey its expectation on the change of earnings type (permanent or transitory) through dividend change in response to earnings change.

An extended form of Equation (5) can be stated in Equation (6) by substituting the values of E_{t-1}^*, E_{t-2}^*, …., E_{t-s}^* into the right side of Equation (5).

$$E_t^* = \delta[E_t + (1-\delta)E_{t-1} + (1-\delta)^2 E_{t-2} + \cdots + (1-\delta)^s E_{t-s}] \tag{6}$$

Solving for E_t^* in Equation (6) and substituting E_t^* into (4) with Koyck transformation, (4) can be rearranged as follows.

$$D_t - D_{t-1} = \gamma\delta E_t - \delta D_{t-1} + \varepsilon_t - (1-\delta)\varepsilon_{t-1} \tag{7}$$

Although Equation (3) seems to be similar with Equation (7) in the choice of independent variables, the nature of the two models are different in interpreting the coefficients. The λ in Equation (3) is the speed of adjustment (SOA), while the δ in Equation (6) is the profit expectation coefficient. Recall that partial adjustment model suggests a firm follows SOA (λ) in its dividend payout in response to a given change in current earnings; consequently, dividends lag behind earnings. In contrast, adaptive expectation model suggests that a firm follows profit expectation coefficient (δ) in its dividend payout in response to a given change in current earnings. For the change in current earnings more attributable to expected long-run earnings change would be bound to a higher profit expectation coefficient. As dividend change increases with profit expectation coefficient, it is generally argued dividend changes convey information about expected changes in long-run earnings; consequently, dividends lead earnings[1].

In the following section, we follow Lee et al. (1987) to propose a generalized model integrating both partial adjustment and adaptive expectation hypotheses. Then, we demonstrate how the generalized model better explains dividend smoothing behavior.

[1] For further discussion, please refer to Fama & Babiak (1968) and Ang (1975).

Assume that the desired dividends ($\overline{D_t}$) at time t are determined by the combination of target payout ratio (γ) and expected long-run earnings (E_t^*) at time t. This relationship can be expressed as

$$\overline{D_t} = \gamma * E_t^* \tag{8}$$

Further, assume that the spirit of partial adjustment process expressed in Equation (2) and the formation of earnings expectations expressed in Equation (5) hold. Lee et al. (1987) integrate both partial adjustment and adaptive expectations models into a general framework as follows.

$$D_t = \alpha + \lambda\gamma\delta[E_t + (1-\delta)E_{t-1} + (1-\delta)^2 E_{t-2} + \cdots + (1-\delta)^s E_{t-s}] + (1-\lambda)D_{t-1} + \mu_t \tag{9}$$

Equation (9) can be simplified by using the Koyck transformation so that

$$D_t - D_{t-1} = \alpha\delta + (1-\lambda-\delta)D_{t-1} - (1-\delta)(1-\lambda)D_{t-2} + \lambda\gamma\delta E_t - (1-\delta)\mu_{t-1} + \mu_t \tag{10}$$

Equation (10) states that current dividends change determined by one, two-years lagged dividend and current earnings. By using this generalized framework, Lee et al. (1987) document that alternative dividend behavior policies listed in Table 1 can be testified. For instance, if δ is not different from 1 but λ is different from 1, the integrated model reduces to the partial adjustment model. If δ is different from 1 but λ is not different from 1, the integrated model reduces to the adaptive expectation model.

Table 1: Alternative dividend payout policy

Hypotheses	Statistical test
1. Partial adjustment process	$\delta = 1$
2. Adaptive expectation (information content)	$\lambda = 1$
3. Myopic dividend policy	$\delta = 1, \lambda = 1$
4. Residual dividend policy	$\delta = 1, \lambda = 1, \gamma = 0$

2.3 Estimation of Integrated Model

Based on the integrated model proposed in the previous section, we attempt to develop an empirical model to test alternative dividend smoothing hypotheses. We rewrite Equation (10) as

$$D_t - D_{t-1} = \alpha_1 + \alpha_2 D_{t-1} + \alpha_3 D_{t-2} + \alpha_4 E_t + v_t \tag{11}$$

Where $\alpha_1 = \alpha\delta,\ \alpha_2 = (1-\lambda-\delta),\ \alpha_3 = -(1-\lambda)(1-\delta), \alpha_4 = \gamma\lambda\delta,\ v_t = u_t - (1-\delta)\,u_{t-1}$

We recognize the integrated model in Equation (10) is inherently nonlinear in parameters and v_t follows an ARMA(1,1) process. Thus, we estimate the model parameters using Marquardt nonlinear regressions[2]. Various initial estimates were tried for each firm-level regression based on a grid for parameters. More specifically, in accordance with theoretical predictions, the initial values of $\gamma, \lambda, and\ \delta$ were bounded by 0 below and 1 above with increments of 0.1.

2.4 **Dividend Smoothing Measure**

Compare partial adjustment model (Lintner, 1956) in Equation (3) with an integrated model in Equation (10); we note that, except for the D_{t-2} and error term, the sample empirical equation will be used under both models unless the parameters are specified a priori. In contrast to the parameter on D_{t-1} in partial adjusted model is $-\lambda$, the responding parameter on D_{t-1} in the integrated model is $(1-\lambda-\delta)$. Recall that λ (speed of adjustment, SOA) specified in partial adjustment model serves a common dividend smoothing measure in literature (SOA inversely related to dividend smoothing) because it measures how dividends change over the year in response to a change in earnings (Leary and Michaely, 2011; Javakhadze, 2014). In contrast, we show that λ and δ come

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[2] We also use Gauss-Newton nonlinear regressions to estimate the model parameters. The untabulated estimations show that Marquardt and Gauss-Newton convergence routines yield very similar results.

along together to determine dividend payout in response to earnings change in the integrated model. More specifically, firms with higher λ and δ will lead to a higher level of dividend change in response to a given change in earnings. Therefore, we argue that dividend smoothing can be decomposed through δ (hereafter, called leading channel) versus λ (hereafter, called lagging channel) which absorbs alternative prevailing dividend payout policies. Meanwhile, we argue the two different channels contribute to better explain cross-sectional variation in determining a firm's propensity to smooth dividends in empirical work.

3.1 Sample Selection and Model Estimations

The sample period for this study extends from 1989 to 2016 with all firms, excluding financial firms (SIC code: 6000-6999). We require each firm to have financial and accounting data available in both CRSP and Compustat databases. In addition, in order to observe dividend payout policy and measure dividend smoothing, we only keep firms with at least 10 years of non-zero dividend payout history (DPS>0). Our final sample consists of 1,193 U.S. firms.

Table 2 summarizes the average cross-sectional distribution of dividend smoothing estimates among partial adjustment model (Lintner, 1956), two-step partial adjustment model (Leary and Michaely, 2011), and the integrated model (Lee et al., 1987), respectively. For the two-step partial adjustment model, we follow Leary and Michaely (2011) to first estimate the target payout ratio as the firm median payout ratio (TPR) over the sample period. Then, we construct the variable of deviation from target payout (dev_t) as the independent variable is added in Linter's model to replace $\overline{(D_t} - D_{t-1})$ as stated in Equation (2). A brief introduction for the two-stage procedure is demonstrated in Equation (12).

$$\Delta D_{it} = \alpha + \beta * dev_{it} + \varepsilon_{it} \quad (12)$$

where $dev_{it} = TPR_i * E_{it} - D_{it-1}$

Table 2 shows that the average estimated dividend smoothing measure ranges from 0.290 to 0.399 among three models. The standard deviations of the mean among the models are 0.349, 0.309, and 0.266, respectively.

[Insert Table 2 here]

To provide further information on dividend payout policy, we classify firms' dividend payout patterns into five different policies shown in Table 3 according to the parameter specified in the integrated model. Group 1 includes 174 firms (14.6% of our observations) with integrated payout policy that contains partial adjustment and adaptive expectation. That is, firms with the estimates of both speed of adjustment (SOA, λ) and earnings expectation coefficient (δ) that are both different from one. Group 2 includes 117 firms (9.8%) with partial adjustment policy where earnings expectation coefficient (δ) is different from one. Group 3 includes 644 firms (54.0%) with adaptive expectation (information content) policy where the speed of adjustment (SOA, λ) is different from one. The rest of the firms fall into myopic (74 firms, 6.2%) or residual (184 firms, 15.4%) policy. Our results show that 68.6% (54.0%+14.6%) of U.S. firms in our sample deliver expected long-term earnings information through dividend payout policy. Meanwhile, our findings show that 15.4% of firms follow residual dividend policy, which suggests that different investment spending plans will lead to different dividend payout. Thus, a dividend is not necessary to be a function of earning.

[Insert Table 3 here]

3.2 Firm characteristics and Dividend Payout Policies

In order to investigate the cross-sectional variation in determining a firm's propensity to smooth dividend, we use a number of proxies to test market frictions in our analysis. From the information asymmetry perspective, it is suggested that firms smooth dividend more as firms face higher information asymmetry. For the proxies to measure the degree of information asymmetry, we use firm size and age as proxies for firm maturity since mature firms face lower information asymmetry (Frank and Goyal, 2010) but have a higher agency conflict (DeAngelo et al., 2006). Second, tangibility and market to book ratio (M/B ratio) are included as proxies for information asymmetry since firms with less tangible assets and greater growth opportunity (M/B ratio) are suggested to face higher information asymmetry (Leary and Michaely, 2011). Third, the volatility of earnings and stock returns are used in our analysis as a proxy for information asymmetry, and we expect volatility to increase with information asymmetry (O'Hara, 2003). Fourth, we include analyst behavior (number of analyst following, dispersion, and accuracy of analysts' forecast) associated with information asymmetry (Weiss, 2010). Finally, prior literature suggests institutional shareholder plays an effective monitoring role by gathering better information to reduce information asymmetry between insiders and outsiders (Javakhadze et al., 2014). We included institutional shareholding as a proxy for information asymmetry.

From an agency problem perspective, it is suggested that a stable and predictable dividend payout occurs as a means of mitigating agency conflicts. In other words, firms facing a greater conflict of interest are motivated to smooth dividend more in order to reduce the agency conflicts. For the proxies to measure the degree of agency conflict, we use M/B ratio as a proxy for the investment opportunity. It is suggested that lower M/B ratio firms that tend to have more free cash suffer more from agency conflict. Therefore, we predict that firms with a lower M/B ratio would smooth dividend more to reduce agency conflict. Likewise, we included firms that are cash cow (profitable firms with high credit rating and a low M/B ratio) as an alternative proxy for agency conflict (Brav et al., 2005). Also, we add institutional holdings to the proxies for agency conflict because firms with greater institutional holdings are referred to as being better monitored. As a result, institutional holdings are suggested to be substitute or complementary for dividend smoothing (Leary and Michaely, 2011). Finally, Lambrecht and Myers (2012) show that dividend smoothing also means gradual adjustment of rents when profitability increases. We use payout ratio as a proxy for shareholders' right and protection.

In Table 4, we report summary statistics for the data. The definitions of all variables are shown in Appendix Table A1. Furthermore, in order to investigate firm characteristics across dividend behaviors, we compare firm characteristics among five dividend payout models (integrated, partial adjustment, adaptive expectation, myopic, and residual model). We first estimate firm-level SOA over our sample period from 1989 to 2016 and calculate the medians of each firm characteristic over our sample period. Second, we report the mean of variables in each group and test the mean difference among groups. Our findings show that, in contrast to firms with partial adjustment model, firms following adaptive expectation policy have a higher institutional shareholding and lower analysts forecasting accuracy. Meanwhile, firms with residual policy are more likely to be younger, leveraged, and less likely to be cash cow compared with firms with integrated model. Overall, we show that firm characteristics vary across different dividend payout policies.

[Insert Table 4 here]

4.1 Dividend smoothing and firm characteristics

In section 2.4, we argue the integrated model is particularly attractive because dividend smoothing can be decomposed through δ (hereafter, called leading channel) versus λ (hereafter, called lagging channel) which absorbs alternative prevailing dividend payout policies. In this section, we investigate the different channels to dividend smoothing to explain cross-sectional variation in determining a firm's propensity to smooth dividend in empirical work.

We sort each firm's characteristic into quintiles by SOA and earnings expectation coefficient. Then, we report the mean of each firm-median characteristic in each quintile and test the difference in means between the 1st and 5th quintiles. Table 5 reports the cross-sectional analysis of whether firms that smooth dividend more differs from firms that smooth less explained by SOA across firm characteristics in all samples. The implication of SOA for dividend smoothing suggests that dividends will tend to lag behind earnings as dividend payout gradually adjusts its dividends to a given change in current earnings. Panel A of Table 5 shows that firms with the most dividend smoothing (reported in the 1st quintile) have a greater institutional shareholding (InstHolding) than firms with the least (reported in the 5th quintile) by 1.91% on average. In addition, our findings show that firms that smooth dividend more tend to be older (FirmAge) and are followed by more analysts (NumAnalyst). In Panel B, we limited our sample to firms with statistically significant SOA only. The findings in institutional shareholding (InstHolding), firm age (FirmAge), and number of analysts (NumAnalyst) following are similar to the results reported in Panel A. In addition, we find that firms that smooth dividend more tend to have greater size, tangible assets ratio(AssetTangibility), payout ratio (PayoutRatio), and financial leverage. These findings suggest that firms subject to more agency conflicts smooth dividend more in accordance with agency theories. Meanwhile, our findings show that SOA is positively associated with earnings volatility (Sd(EBITDA)) and stock return volatility (Sd(Return)) which are not consistent with the predictions from information asymmetry theory. Overall, our findings provide support for agency-based explanation across SOA quintiles (Leary and Michaely, 2011).

[Insert Table 5 here]

Table 6 reports a cross-sectional analysis of whether firms that smooth dividend more differ from firms that smooth less explained by earnings expectation coefficient across firm characteristics. A higher profit expectation coefficient (δ) indicates that current earnings change is more attributable to expected long-run earnings change and leads to less dividend smoothing. For the information asymmetry and agency proxies, we find that firms that smooth dividend the most (reported in the 1st quintile) have a greater institutional shareholding (InstHolding), maturity (FirmAge), and leverage than firms that smooth the least (reported in the 5th quintile) in Panel A and B. In addition, our findings show that firms that smooth dividend more tend to have lower dispersion (FcstDispersion) and more accuracy (reversely related to forecasts deviation, FcstDeviation) in analysts' forecasts. Overall, our findings provide support for agency-based and information asymmetry explanations across earnings expectation coefficient (δ) quintiles.

[Insert Table 6 here]

4.2 Empirical Results: Determinants of Dividend Smoothing

We continue with our cross-sectional analysis in determining a firm's propensity to smooth dividend by using multivariate regression. Table 7 presents results with SOA (λ) as the dependent variable proxy for dividend smoothing. Column (1) of Table 7 includes proxies with implications for agency cost (MA/MA, CashCow) and monitoring mechanism (StockTurnover, InstHolding). From the agency conflict perspective, we expect that firms with a higher agency cost (lower M/B ratio, more free cash) and stronger monitoring mechanism (lower stock turnover, higher institutional shareholder) will smooth dividend more. Consistent with the univariate results, we find that dividend smoothing is more pronounced in firms with a stronger monitoring mechanism. However, we do not find evidence to support the notion that low M/B ratio or cash cow firms smooth dividend more. In columns (2) to (10), we add, one at a time, additional proxies for information asymmetry which are highly correlated (Leary and Michaely, 2011; Javakhadze, 2014). Our findings show that older firms (FirmAge), firms with more long-term investor (lower stock turnover) and institutional shareholders (InstHolding), greater size (Size), more analysts following (NumAnalyst), and more accurate forecasts (lower FcstDeviation) smooth dividend more. In other words, the results suggest that firms with a stronger monitoring mechanism or firms subject to more agency conflict will smooth dividend as agency conflict hypothesis predicts.

[Insert Table 7 here]

Table 8 presents results with earnings expectation coefficient (δ) as the dependent variable proxy for dividend smoothing. Recall that earnings expectation coefficient (δ) is the proportion of the current change in earnings taken to be permanent rather than transitory. Therefore, the magnitude of managerial revision on expected long-run earnings depends on the size of δ where the high value of δ conveys a more substantial adjustment in expectations and leads to less smoothing. Our multivariate results show that firms with lower M/B ratio, higher institutional shareholding, and lower accuracy of analyst forecasts (higher FcstDeviation) have a lower earnings expectation coefficient which suggests that firms subject to lower growth opportunity, greater monitoring mechanism or higher information asymmetry will smooth dividend more.

[Insert Table 8 here]

5. Robustness

In this section, we perform several additional robustness checks to ensure that our results are consistent across different specifications. First, we develop annual dividend smoothing measures (λ, δ) for each firm by using an 11-years rolling period. In addition, we classify firms' annual payout patterns into five alternative dividend policies to investigate the prevalence of dividend policy over time. Second, we raise concern over time trend in dividend smoothing across firm characteristics, we conduct multivariate panel regression that controls for time trend and industry-fixed effect along with proxies for market frictions to re-examine a firm's propensity to smooth dividend over time. Third, as we argue that dividend smoothing behavior can be captured through two channels: (1) lagging channel (via speed of partial adjustment, SOA) and (2) leading or signaling channel (via earnings expectation coefficient, δ), we suggest that dividend change convey managerial expectations on long-term earnings change through δ, not SOA. In other words, we relate δ to a signaling channel for future earnings. Thus, one would expect current δ predicts future earnings. To investigate the general relation between dividend smoothing and future earnings, we estimate earnings persistence model by regressing future earnings (one-year ahead and two-year ahead return on assets, ROA) on current ROA after conditioning on alternative dividend smoothing measure.

5.1 Dividend payout policy over time

In this section, we examine whether the prevalence of dividend policy varies over time. First, we estimate annual dividend smoothing measures (λ, δ) for each firm by using an 11-years rolling period. For instance, the measure for the year of 1999 is estimated by using Equation (11) with a year sample from 1989 through 1999. Second, we classify firms' annual-level dividend payout pattern into five dividend policies by using the criterion for estimates specified in Table 1. Third, we split our sample into three sub-periods: (1)1998-2006, (2) 2007-2009 (financial crisis period), and (3) 2010-2016 and compare the prevalence of dividend policy across the periods. In Panel A of Table 9, we show that the adaptive expectation and residual model prevail during the period 1998-2006, where 39.2% and 30.7% of the observed sample is attributed to adaptive expectation and residual model respectively. Compared with the period during 1998-2006, our results show that the proportion of firms with adaptive expectation increases by 5.9% and residual model decreases by 6.2% during the period 2010-2016. In addition, both smoothing measures (λ, δ) seem to decrease over time (average λ=0.992, average δ=0.529 during 1998-2006; average λ=0.965, average δ=0.465 during 2010-2016), which indicate an increased tendency to dividend smoothing over time.

[Insert Table 9 here]

5.2 Determinants of Dividend Smoothing: Multivariate Regression Analysis of Panel Data

To complement the notion of an increased tendency of dividend smoothing over time in the previous section, we conduct a multivariate panel regression that controls for time trend and industry-fixed effect along with proxies for market frictions to examine a firm's propensity to smooth dividend over time. Table 10 presents results with SOA (λ) as the dependent variable proxy for dividend smoothing. Column (1) of Table 10 includes time-varying factor (time trend) and proxies with implications for agency cost and monitoring mechanism (MA/BA, StockTurnover, InstHolding). Again, in columns (2) to (10), we add, one at a time, additional proxies for information asymmetry which are highly correlated (Leary and Michaely, 2011; Javakhadze, 2014). First, we do not find evidence to support an increased tendency of dividend smoothing over time through the lagging channel (via speed of partial adjustment, SOA) in Table 10 since the estimated coefficient on time trend is negative but not statistically significant. Second, for the proxies of agency conflicts, our results show that dividend smoothing is more pronounced in firms with lower growth opportunity (MA/BA), a stronger monitoring mechanism (InstHolding), and greater maturity (Size, FirmAge) as agency conflict hypothesis predicts. The results are consistent with the findings in cross-sectional analysis noted in Section 4.2.

[Insert Table 10 here]

Table 11 presents results with earnings expectation coefficient (δ) as the dependent variable proxy for dividend smoothing. Our findings show that the estimated coefficient on time trend is negative and significant. The results suggest an increased tendency of dividend smoothing over time from 1998 through 2016 with a decreased earnings expectation coefficient. Second, our multivariate results show that M/B ratio (institutional shareholding, stock return volatility) are positively (negatively) associated with earnings expectation coefficient which suggest that earnings change in firms with less growth opportunity (MA/BA), stronger monitoring mechanism (InstHolding), greater stock return volatility, and analysts' forecasting deviation convey less managerial expectations of long-term earnings and lead to more dividend smoothing. In other words, firms subject to lower growth opportunity, greater monitoring mechanism or higher information asymmetry will smooth dividend more. Overall, our results suggest that there is a trend toward greater dividend smoothing through the leading channel (δ)when firms are subject to higher information asymmetry or lower growth opportunity over time.

[Insert Table 11 here]

5.3 Dividend Smoothing and Earnings Persistence

The generalized empirical model noted in Section 2.2 suggests that dividend change conveys managerial expectations on long-term earnings through the leading channel of earnings expectation coefficient (δ). Thus, we relate δ to a signaling feature for future earnings. In this section, we investigate the general relation between dividend smoothing and future earnings. We employ an earnings persistence model (Richardson et al., 2005) by regressing future earnings (one-year ahead and two-year ahead return on assets, ROA) on current ROA after conditioning on alternative dividend smoothing measure (δ *and* SOA).

In order to test the signaling explanation of dividend smoothing on future earnings, we rank firms' annual smoothing measures (δ *and* SOA) by year into deciles in controlling for time trend effect and re-scale them to range between zero and one. Specifically, our test models are described below:

One-year-ahead earnings Persistence

$$(E_{it+1}/TA_{it-1}) = \beta_0 + \beta_1 (E_{it}/TA_{it-1}) + \beta_2 Rank\_\delta_{it} + \beta_3 (E_{it}/TA_{it-1}) * Rank\_\delta_{it} + \mu_t \quad (13)$$

$$(E_{it+1}/TA_{it-1}) = \alpha_1 + \alpha_1 (E_{it}/TA_{it-1}) + \alpha_2 Rank\_SOA_{it} + \alpha_3 (E_{it}/TA_{it-1}) * Rank\_SOA_{it} + \epsilon_t \quad (14)$$

Two-year-ahead earnings Persistence

$$(E_{it+2}/TA_{it-1}) = \sigma_0 + \sigma_1 (E_{it}/TA_{it-1}) + \sigma_2 Rank\_\delta_{it} + \sigma_3 (E_{it}/TA_{it-1}) * Rank\_\delta_{it} + \varepsilon_t \quad (15)$$

$$(E_{it+2}/TA_{it-1}) = \theta_0 + \theta_1 (E_{it}/TA_{it-1}) + \theta_2 Rank\_SOA_{it} + \theta_3 (E_{it}/TA_{it-1}) * Rank\_SOA_{it} + \omega_t \quad (16)$$

where E_{it} is earnings (income before extra-ordinary items) for firm i in year t; TA_{it-1} is total assets for firm i in year t-1. E_{it} deflated by beginning total asset (TA_{it-1}) can be interpreted as ROA (return on assets) for firm i in year t. $Rank\_\delta_{it}$ ($Rank\_SOA_{it}$) is a ranked variable (set between 0 and 1) to capture the magnitude of δ (SOA) for firm i in year t. In the model specification in Equation (13) and (15), β_1 and σ_1 measures one-year and two-year ahead earnings persistence for firms with the lowest ranked value of δ measures ($\delta = 0$), respectively. Likewise, the sum of the coefficient ($\beta_1 + \beta_3$; $\sigma_1 + \sigma_3$) measures the earnings persistence for firms with the highest ranked of δ measure ($\delta = 1$). Under the hypothesis that the informativeness of current earnings about future earnings increases in the level of profit expectation coefficient ($Rank\_\delta_{it}$), we expect β_3 and σ_3 are significantly positive.

In contrast to earnings expectation coefficient (δ) that serves as a signaling channel for future earnings, the lagging nature of SOA (λ) on current earnings is not informative about future earnings under the partial adjustment hypothesis. In other words, we expect SOA does not serve as a signal channel for future earnings. As the coefficients on interaction terms between (E_{it}/TA_{it-1}) and $Rank\_SOA_{it}$ (α_3, θ_3) in Equation (14) and (16) measure the incremental effect of dividend smoothing on earnings persistence, we expect α_3 *and* θ_3 are not significantly different from zero.

Table 12 reports the results of estimating Equation (13) through (16). Column (1) of Panel A shows that the average one-year-ahead earnings persistence is 0.607 over our sample period. As we add ranked variables based on dividend smoothing measure into the model, column (2) shows that the coefficient on interaction term between (E_{it}/TA_{it-1}) and $Rank\_SOA_{it}$ is negative (-0.115) but not significant where the interaction term between (E_{it}/TA_{it-1}) and $Rank\_\delta_{it}$ shown in column (3) is significantly positive (0.208). The findings are consistence with the notion of different nature between SOA and earnings expectation coefficient. That is, dividends lag behind earnings via SOA and lead earnings via δ. Panel B shows the effect of SOA and δ on two-year ahead earnings persistence. We find that the effect of SOA on two-year ahead earnings persistence shown in column (5) is positive but not significant (0.049) where the effect of δ shown in column (6) is significantly positive (0.213). Overall, the results with two-year ahead earnings persistence models are very similar to the findings in panel A. That is, the coefficients significantly positive for interaction terms between (E_{it}/TA_{it-1}) and $Rank\_\delta_{it}$ but are insignificant for iteration terms between (E_{it}/TA_{it-1}) and $Rank\_SOA_{it}$.

[Insert Table 12 here]

6. Conclusion

Prior studies suggest that dividend smoothing serves a role in mitigating information asymmetry or agency conflict, but there is surprisingly little consensus on the debate of explaining dividend smoothing from two different prevailing views: the partial adjustment and information content hypothesis. We extend this research by documenting the channels by which dividend smoothing relates to multiple market frictions. Specifically, we develop a generalized empirical model that integrates two alternative dividend smoothing hypotheses and measure dividend smoothing behaviors through two channels: (1) lagging channel with speed of adjustment (SOA, λ) and (2) leading channel with earnings expectation coefficient (δ).

Our developed dividend smoothing measures better explain alternative hypotheses when tested in several ways. First, by using cross-sectional analysis, our findings show firms with a greater monitoring mechanisms smooth dividend more through lagging channel (SOA) and leading channel (δ). Meanwhile, our results indicate firms subject to higher information asymmetry or lower growth opportunity will smooth dividend more through the leading channel (δ). Second, we explore time trends in dividend smoothing by estimating annul level dividend smoothing measures.

We conduct multivariate panel regression that controls for time trend and industry-fixed effect along with proxies for market frictions to re-examine a firm's propensity to smooth dividend. We show that the results with panel data analysis are similar to the findings in the cross-sectional analysis. Finally, we investigate the general relation between dividend smoothing and future earnings. We employ earnings persistence model after conditioning on alternative dividend smoothing measures to investigate the incremental effect of dividend on earnings persistence. Our findings support the notion that dividend smoothing conveys information about future earnings through leading channel (δ) instead of lagging channel (SOA) as suggested in the generalized model.

While our findings suggest dividend smoothing behavior can be decomposed into two measures with different nature, an opportunity exists to extend our findings in several ways. First, our results imply that Lambrecht and Myers's theoretical model (2012) need to be re-examined in terms of five alternative dividend behavior models found in this study. Second, one could explore how SOA and earnings expectation coefficient relates to repurchase policy, while repurchase grew strongly and exceeded dividends in this decade (Floyd et al., 2015). Third, one could examine how earnings expectation coefficient conveys information to market and analysts forecast. Fourth, our findings raise a new question by asking why an increased tendency of dividend smoothing through the leading channel exists over time. We leave these issues for future research.

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Appendix

Table A1: Variable definitions

Variables	Definition	Data source
DPS	Common dividends per share (item: DVPSX)	Compustat
EPS	Earnings per share (item: EPSPX)	Compustat
Size	The natural log of book assets (item:AT)	Compustat
FirmAge	The number of years since the firm first becomes available in the compustat database	Compustat
AssetTangibility	Net property, plant and equipment (item: PPENT) scaled by total book assets (item: AT)	Compustat
MA/BA	The market value of equity plus the book value of asset minus the book value of equity, scaled by total book value of assets.	Compustat
Sd(EBITDA)	The standard deviation of the ratio of EBITDA (item: OIBDP) scaled by total asset	Compustat
Sd(Return)	The annual standard deviation of monthly stock returns (item: RET)	CRSP
Beta	The firm's equity beta (item: BETAV)	CRSP
Num Analyst	The average number of analysts reporting earnings estimates (item: NUMEST)	I/B/E/S
FcstDispersion	The standard deviation of average analyst forecasts of the current year's EPS over the months of the fiscal year	I/B/E/S
FcstDeviation	The absolute difference between the median analyst forecast of the current year's EPS and actual EPS over the months of the fiscal year, deflated by actual EPS.	I/B/E/S
CashCow	A dummy variable equal to one for firms with positive earnings and with A (or better) S&P debt rating and has a Price/Earnings (P/E) ratio lower than the median P/E for profitable firms with A or better S&P debt rating.	Compustat
InstHolding	All the shareholding across institution deflated by total shares outstanding.	Thompson Financial
StockTurnover	The average of the ratio of monthly traded volume of shares to total shares outstanding.	CRSP
PayoutRatio	Common dividends per share (item: DVPSX) divided by income before extraordinary itmes (item:IB)	Compustat
DivYield	Common dividends per share (item: DVPSX) divided by year-end share price (item: PRCC)	Compustat
Leverage	The sum of short-term (item: DLC) and long-term (item: DLTT) debt deflated by total book assets (item: AT).	Compustat

Table 2: Dividend Smoothing Measures

This table presents summary statistics for alternative dividend smoothing measures.

1. Partial adjustment model (Lintner, 1956): $Dividend\ smoothing\ measure = -\beta_1$

$$D_t - D_{t-1} = \alpha + \beta_1 D_{t-1} + \beta_2 E_t + \mu_t$$

2. Two-step partial adjustment model (Leary and Michaely, 2011): $Dividend\ smoothing\ measure = \beta$

1st stage: $dev_t = TPR * E_t - D_{t-1}$

2nd stage: $D_t - D_{t-1} = \alpha + \beta * dev_t + \varepsilon_t$

3. Integrated model (Lee et al., 1987): $Dividend\ smoothing\ measure = -\alpha_2$

$$D_t - D_{t-1} = \alpha_1 + \alpha_2 D_{t-1} - \alpha_3 D_{t-2} + \alpha_4 E_t + v_t$$

Where $\alpha_1 = \alpha\delta,\ \alpha_2 = (1 - \lambda - \delta),\ \alpha_3 = (1 - \lambda)(1 - \delta), \alpha_4 = \gamma\lambda\delta,\ v_t = u_t - (1 - \delta)\, u_{t-1}$

Dividend smoothing measure	Mean	Standard Deviation	Min	25th percentile	Median	75th percentile	Max	Skewness	Kurtosis
1. Lintner's Model	0.399	0.349	-0.186	0.128	0.323	0.629	1.287	0.565	-0.591
2. Two-step Model	0.290	0.309	-0.159	0.064	0.190	0.446	1.137	1.090	0.364
3. Integrated model	0.317	0.266	0.001	0.179	0.266	0.420	1.549	0.228	12.241

Table 3: Mean and Standard Deviation of the Estimated Structural Parameters for Different Dividend Payout Policies

The integrated model to test alternative dividend payout policies**:**

$$D_t - D_{t-1} = \alpha_1 + \alpha_2 D_{t-1} + \alpha_3 D_{t-2} + \alpha_4 E_t + v_t \quad (11)$$

Where $\alpha_1 = \alpha\delta,\ \alpha_2 = (1-\lambda-\delta),\ \alpha_3 = -(1-\lambda)(1-\delta), \alpha_4 = \gamma\lambda\delta,\ v_t = u_t - (1-\delta)\, u_{t-1}$

Model specification for alternative dividend payout policies

Dividend Payout Policies	Statistical test
1. Partial adjustment process	$\delta = 1$
2. Adaptive expectation (information content)	$\lambda = 1$
3. Myopic dividend policy	$\delta = 1, \lambda = 1$
4. Residual dividend policy	$\delta = 1, \lambda = 1, \gamma = 0$

Group	Parameters				Number of companies
	γ	α	λ	δ	
1. Integrated model	1.089 (2.495)	-0.042 (1.656)	1.107 (0.541)	0.506 (0.546)	174 (14.6%)
2. Partial adjustment model	0.593 (1.361)	0.076 (0.247)	0.309 (0.200)	1.034 (0.232)	117 (9.8%)
3. Adaptive expectation model	0.906 (2.182)	-0.147 (1.804)	1.015 (0.211)	0.215 (0.162)	644 (54.0%)
4. Myopic Model	0.389 (0.369)	0.286 (0.470)	0.876 (0.239)	0.777 (0.290)	74 (6.2%)
5. Residual Model	0.317 (1.383)	0.370 (1.038)	0.849 (0.310)	0.623 (0.317)	184 (15.4%)
Overall sample	0.779 (2.006)	-0.003 (1.542)	0.925 (0.369)	0.436 (0.398)	1,193

1. The integrated model in Equation (10) is inherently nonlinear in parameters and v_t follows an ARMA(1,1) process. We estimate the model parameters using Marquardt nonlinear regressions
2. The mean of parameters and standard deviation (in parentheses) are reported in each group.

Table 4: Firm Characteristics across Dividend Payout Policies

This table presents means of each firm-median characteristics among different dividend payout groups. The columns labeled mean difference test report mean difference between two alternative dividend policies. For instance, the column labeled t(1-2) reports the results of a t-test of equal means between integrated model and partial adjustment model. All variables are defined in Appendix Table A1***, **, and * denote significance at the 1%, 5%, and 10% level respectively.

	Dividend Behavior Classification					**Mean difference Test**			
Characteristic	1 Integrated Model	2 Partial Adjustment	3 Adaptive Expectation	4 Myopic Model	5 Residual Model	t (1-2)	t (1-3)	t (1-5)	t (2-3)
MA/BA	1.526	1.435	1.475	1.483	1.367	1.17	0.76	1.99**	-0.66
CashCow	0.051	0.044	0.034	0.023	0.004	0.29	1.01	2.81***	0.53
StockTurnover	1.105	0.914	1.037	1.443	1.034	1.76*	0.71	0.62	-1.74*
InstHolding	0.342	0.382	0.468	0.347	0.381	-1.07	-4.68***	-1.10	-2.70***
Size	7.089	7.290	7.369	7.843	7.206	-0.75	-1.45	-0.50	-0.37
FirmAge	33.80	38.45	38.56	35.49	30.66	-2.29**	-3.52***	1.91*	-0.06
AssetTangibility	0.364	0.379	0.374	0.490	0.366	-0.53	-0.51	-0.06	0.20
Sd(EBITDA)	0.056	0.053	0.052	0.055	0.056	0.64	1.22	-0.11	0.28
Sd(Return)	0.085	0.084	0.083	0.079	0.087	0.47	0.92	-0.58	0.27
NumAnalyst	4.733	5.133	5.833	5.049	4.891	-0.76	-2.75***	-0.31	-1.60
FcstDispersion	0.654	0.575	0.563	0.597	0.665	1.42	2.33**	-0.23	0.25
FcstDeviation	0.348	0.298	0.371	0.468	0.398	0.95	-0.50	-0.86	-2.02***
PayoutRatio	0.289	0.319	0.353	0.469	0.350	-0.71	-1.68*	-1.19	-1.04
Leverage	0.182	0.236	0.253	0.273	0.270	-3.21***	-5.68***	-5.24***	-1.29

Table 5: Firm Characteristics across Speed of Adjustment (SOA, λ)

This table presents means of each firm-median characteristics across speed of adjustments (SOA) quintiles. The column labeled t(1-5) reports the results of a t-test of equal means between first and fifth quintiles. All variables are defined in Appendix Table A1. ***, **, and * denote significance at the 1%, 5%, and 10% level respectively.

Panel A: speed of adjustment (SOA, λ) (all sample)

	SOA (λ) Quintile						
Characteristic	1	2	3	4	5	t (1-5)	
MA/BA	1.442	1.456	1.323	1.556	1.536	-1.26	
CashCow	0.032	0.026	0.030	0.044	0.028	0.27	
StockTurnover	1.007	1.044	1.017	1.070	1.142	-1.41	
InstHolding	0.401	0.488	0.449	0.428	0.343	1.91	*
Size	7.236	7.421	7.455	7.496	7.003	1.12	
FirmAge	37.622	38.435	38.534	36.442	31.694	4.3	***
AssetTangibility	0.381	0.379	0.414	0.365	0.355	1.2	
Sd(EBITDA)	0.055	0.051	0.048	0.052	0.061	0.162	
Sd(Return)	0.083	0.084	0.082	0.082	0.087	-1.63	
Num Analyst	5.444	5.703	5.885	5.682	4.370	2.59	***
FcstDispersion	0.610	0.588	0.056	0.574	0.634	-0.55	
FcstDeviation	0.329	0.359	0.330	0.419	0.404	-1.59	
PayoutRatio	0.344	0.373	0.347	0.350	0.317	0.76	
Leverage	0.220	0.265	0.279	0.250	0.209	0.74	

Panel B: speed of adjustment (SOA, λ) (only including firms with significant λ)

	SOA (λ) Quintile						
Characteristic	1	2	3	4	5	t (1-5)	
MA/BA	1.487	1.377	1.478	1.516	1.562	-0.81	
CashCow	0.041	0.040	0.061	0.015	0.035	0.26	
StockTurnover	1.028	1.019	1.056	1.053	1.197	-1.57	
InstHolding	0.444	0.511	0.473	0.390	0.329	3.34	***
Size	7.494	7.683	7.550	7.104	7.042	1.94	*
FirmAge	42.740	41.473	40.812	33.275	31.450	6.48	***
AssetTangibility	0.389	0.382	0.379	0.362	0.348	1.69	*
Sd(EBITDA)	0.052	0.047	0.054	0.051	0.063	-2.44	**
Sd(Return)	0.083	0.078	0.083	0.081	0.089	-2.01	**
Num Analyst	5.545	6.474	5.903	5.079	4.505	2.18	**
FcstDispersion	0.609	0.502	0.540	0.623	0.633	-0.49	
FcstDeviation	0.368	0.299	0.400	0.381	0.397	-0.52	
PayoutRatio	0.374	0.333	0.345	0.389	0.295	1.83	*
Leverage	0.238	0.269	0.256	0.251	0.200	2.29	**

Table 6: Firm Characteristics across Profit Expectation Coefficient (δ)

This table presents means of each firm-median characteristics across profit expectation coefficient (δ) quintiles. The column labeled t(1-5) reports the results of a t-test of equal means between first and fifth quintiles. All variables are defined in Appendix Table A1. ***, **, and * denote significance at the 1%, 5%, and 10% level respectively.

Panel A: profit expectation coefficient (δ) (all sample)

	Profit expectation coefficient (δ) Quintile						
Characteristic	1	2	3	4	5	t (1-5)	
MA/BA	1.575	1.365	1.500	1.384	1.496	1.08	
CashCow	0.057	0.034	0.026	0.019	0.024	1.89	*
StockTurnover	0.965	1.080	1.149	1.035	1.046	-1.02	
InstHolding	0.498	0.479	0.454	0.348	0.317	6.26	***
Size	7.327	7.297	7.488	7.228	7.258	0.35	
FirmAge	39.065	38.834	36.932	32.276	35.236	2.32	**
AssetTangibility	0.330	0.383	0.391	0.409	0.380	-2.39	**
Sd(EBITDA)	0.050	0.053	0.056	0.054	0.054	-1.12	
Sd(Return)	0.081	0.089	0.082	0.082	0.086	-1.85	*
Num Analyst	6.469	5.409	5.581	4.874	4.685	3.98	***
FcstDispersion	0.510	0.572	0.566	0.645	0.676	-3.87	***
FcstDeviation	0.343	0.423	0.357	0.349	0.372	-0.55	
PayoutRatio	0.367	0.315	0.365	0.324	0.359	0.20	
Leverage	0.245	0.246	0.253	0.261	0.215	2.16	**

Panel B: profit expectation coefficient (δ) (only including firms with significant δ)

	Profit expectation coefficient (δ) Quintile						
Characteristic	1	2	3	4	5	t (1-5)	
MA/BA	1.601	1.607	1.423	1.444	1.593	0.06	
CashCow	0.054	0.032	0.032	0.021	0.038	0.53	
StockTurnover	1.030	1.135	1.022	1.152	1.014	0.10	
InstHolding	0.427	0.389	0.309	0.372	0.258	3.95	***
Size	7.466	7.384	7.260	7.613	7.708	1.13	
FirmAge	38.879	36.978	35.644	40.494	31.833	2.75	***
AssetTangibility	0.421	0.409	0.395	0.365	0.382	1.05	
Sd(EBITDA)	0.051	0.063	0.049	0.055	0.055	-0.82	
Sd(Return)	0.077	0.081	0.081	0.085	0.083	-1.37	
Num Analyst	7.984	4.673	4.367	5.353	4.767	0.32	
FcstDispersion	0.445	0.559	0.649	0.608	0.727	-4.12	***
FcstDeviation	0.252	0.363	0.336	0.354	0.378	-1.93	*
PayoutRatio	0.252	0.378	0.244	0.337	0.408	-0.48	
Leverage	0.385	0.225	0.252	0.237	0.171	3.39	***

Table 7: Determinants of Speed of Adjustment: Cross-sectional Regression

This table reports the cross-sectional analysis in determining a firm's propensity to smooth dividend through lagging channel (SOA, λ). All variables are defined in Appendix Table A1. Robust t-statistics adjusted for heteroskedasticity are reported in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% level respectively.

Dependent variable: Speed of Adjustment (SOA, λ)											
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
MA/BA	0.018	0.014	0.013	0.015	0.015	0.019	0.025	0.018	0.028*	0.018	0.023
	(1.24)	(1.00)	(0.93)	(1.01)	(1.02)	(1.29)	(1.63)	(1.25)	(1.85)	(1.21)	(1.20)
CashCow	0.014	0.045	0.034	0.018	0.017	0.024	0.018	0.015	0.007	0.012	0.046
	(0.25)	(0.77)	(0.60)	(0.33)	(0.31)	(0.42)	(0.31)	(0.26)	(0.13)	(0.22)	(0.79)
StockTurnover	0.030**	0.040**	0.018	0.029**	0.029**	0.026*	0.040**	0.030**	0.028**	0.031**	0.029*
	(2.25)	(2.89)	(1.39)	(2.23)	(2.15)	(1.91)	(2.84)	(2.26)	(2.03)	(2.27)	(1.69)
InstHolding	-0.096**	-0.090**	-0.044	-0.100**	-0.093**	-0.092**	-0.062	-0.093**	-0.102**	-0.094**	-0.048
	(-2.36)	(-2.24)	(-1.03)	(-2.43)	(-2.31)	(-2.28)	(-1.30)	(-2.23)	(-2.38)	(-2.29)	(-0.87)
Size		-0.012*									-0.009
		(-1.91)									(-0.95)
FirmAge			-0.002**								-0.002**
			(-3.20)								(-2.87)
AssetTangibility				-0.042							-0.009
				(-0.85)							(-0.17)
Sd(EBITDA)					0.192						-0.142
					(0.55)						(-0.31)
Sd(Return)						0.349					-0.288
						(0.84)					(-0.44)
NumAnalyst							-0.006**				-0.002
							(-2.00)				(-0.63)
FcstDispersion								0.005			0.001
								(0.19)			(0.05)
FcstDeviation									0.047*		0.036
									(1.78)		(1.20)
PayoutRatio										0.010	-0.025
										(0.41)	(-0.69)
Constant	0.926***	1.007***	1.005***	0.948***	0.919***	0.897***	0.924***	0.920***	0.902***	0.921***	1.093***
	(28.96)	(18.32)	(24.70)	(22.24)	(27.86)	(19.35)	(26.35)	(23.48)	(23.65)	(26.72)	(8.79)
Observation	982	982	982	982	982	982	906	982	906	982	906
Adjusted R^2	0.007	0.009	0.014	0.006	0.006	0.006	0.011	0.006	0.012	0.005	0.016

Table 8: Determinants of Profit Expectation Coefficient: Cross-sectional Regression

This table reports the cross-sectional analysis in determining a firm's propensity to smooth dividend through leading channel (Profit expectation coefficient, δ). All variables are defined in Appendix Table A1. Robust t-statistics adjusted for heteroskedasticity are reported in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% level respectively.

Panel A: Profit expectation coefficient (δ) (all samples)										
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
MA/BA	0.028*	0.027*	0.028*	0.028*	0.030*	0.028*	0.025	0.033**	0.017	0.031
	(1.70)	(1.66)	(1.71)	(1.71)	(1.72)	(1.67)	(1.46)	(2.00)	(1.01)	(1.50)
StockTurnover	0.017	0.019	0.018	0.017	0.018	0.018	0.014	0.021	0.018	0.021
	(1.23)	(1.30)	(1.24)	(1.23)	(1.27)	(1.21)	(0.96)	(1.52)	(1.26)	(1.17)
InstHolding	-0.346**	-0.346***	-0.350***	-0.345***	-0.348***	-0.347***	-0.327***	-0.320***	-0.324***	-0.250***
	(-8.35)	(-8.38)	(-8.34)	(-8.10)	(-8.41)	(-8.37)	(-6.92)	(-7.80)	(-7.64)	(-4.96)
Size		-0.001								0.008
		(-0.29)								(0.83)
FirmAge			0.001							-0.001
			(0.25)							(-0.66)
AssetTangibility				0.01						0.060
				(0.24)						(1.06)
Sd(EBITDA)					-0.145					0.020
					(-0.44)					(0.05)
Sd(Return)						-0.103				-0.304
						(-0.23)				(-0.46)
NumAnalyst							-0.001			-0.004
							(-0.07)			(-0.96)
FcstDispersion								0.062**		0.103***
								(2.23)		(3.20)
FcstDeviation									-0.039*	-0.065**
									(-1.68)	(-2.49)
Constant	0.528***	0.541***	0.521***	0.521***	0.533***	0.536***	0.529***	0.472***	0.546***	0.429***
	(15.76)	(9.31)	(11.65)	(11.31)	(15.65)	(11.00)	(14.67)	(11.72)	(14.37)	(3.24)
Observation	982	982	982	982	982	982	906	982	906	906
Adjusted R^2	0.064	0.063	0.063	0.063	0.063	0.063	0.057	0.068	0.056	0.061

Table 9: Dividend Smoothing Behavior across Periods

This table reports the prevalence of dividend policy varying over the periods. We classify firms' annual-level dividend payout pattern into five dividend policies by using the criterion for estimates specified in Table 1. We split our sample into three sub-periods: (1)1998-2006, (2) 2007-2009 (financial crisis period), and (3) 2010-2016 and compare the prevalence of dividend policy across the periods. The mean of parameters and standard deviation (in parentheses) are reported in each group.

Panel A: 1998 - 2006

Group	Parameters		Number of firm-year sample
	λ	δ	
1. Integrated model	1.172 (0.634)	0.715 (0.637)	944 (14.8%)
2. Partial adjustment model	0.399 (0.491)	1.149 (0.446)	552 (8.6%)
3. Adaptive expectation model	1.144 (0.290)	0.206 (0.251)	2,504 (39.2%)
4. Myopic Model	0.998 (0.287)	0.914 (0.290)	426 (6.7%)
5. Residual Model	0.875 (0.435)	0.593 (0.436)	1,963 (30.7%)
Overall sample	0.992 (0.475)	0.529 (0.506)	6,389

Panel B: 2007-2009 (Financial crisis period)

Group	Parameters		Number of firm-year sample
	λ	δ	
1. Integrated model	1.180 (0.713)	0.659 (0.723)	307 (13.9%)
2. Partial adjustment model	0.307 (0.387)	1.093 (0.455)	182 (8.2%)
3. Adaptive expectation model	1.140 (0.337)	0.176 (0.241)	980 (44.2%)
4. Myopic Model	0.997 (0.328)	0.898 (0.361)	126 (5.7%)
5. Residual Model	0.845 (0.475)	0.550 (0.444)	621 (28.0%)
Overall sample	0.989 (0.511)	0.464 (0.514)	2,216

Panel C: 2010-2016

Group	Parameters		Number of firm-year sample
	λ	δ	
1. Integrated model	1.191 (0.690)	0.581 (0.704)	803 (15.4%)
2. Partial adjustment model	0.357 (0.510)	1.110 (0.490)	487 (9.3%)
3. Adaptive expectation model	1.087 (0.328)	0.179 (0.259)	2,359 (45.1%)
4. Myopic Model	1.022 (0.286)	0.878 (0.336)	296 (5.7%)
5. Residual Model	0.817 (0.437)	0.580 (0.455)	1,280 (24.5%)
Overall sample	0.965 (0.502)	0.465 (0.526)	5,225

Table 10: Determinants of Speed of Adjustment: Panel Data

This table reports the panel data analysis in determining a firm's propensity to smooth dividend through lagging channel (SOA, λ). All variables are defined in Appendix Table A1. Robust t-statistics adjusted for heteroskedasticity are reported in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% level respectively.

Dependent variable: Speed of Adjustment (SOA, λ) (all samples)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Time Trend	0.001	0.001	0.001	0.001	0.001	0.002*	0.001	0.001	0.001	0.001	0.001
	(1.11)	(1.11)	(0.65)	(1.22)	(1.07)	(1.95)	(1.04)	(1.09)	(0.94)	(1.21)	(0.90)
MA/BA	0.011**	0.010**	0.010*	0.011**	0.010*	0.013***	0.005	0.010**	0.009	0.011**	0.011
	(2.03)	(2.01)	(1.82)	(2.09)	(1.82)	(2.61)	(0.91)	(2.04)	(1.50)	(2.08)	(1.62)
StockTurnover	0.001	0.001	-0.001	0.001	0.001	-0.004	-0.001	0.001	-0.001	0.001	-0.014**
	(0.13)	(0.16)	(-0.28)	(0.21)	(0.10)	(-0.74)	(-0.16)	(0.16)	(-0.11)	(0.03)	(-2.19)
InstHolding	-0.214***	-0.213***	-0.176***	-0.212***	-0.212***	-0.209***	-0.247***	-0.212***	-0.221***	-0.214***	-0.174***
	(-9.93)	(-9.84)	(-7.56)	(-9.75)	(-9.85)	(-9.63)	(-9.69)	(-9.01)	(-9.18)	(-9.95)	(-5.66)
Size		-0.001									0.011**
		(-0.12)									(2.08)
FirmAge			-0.002***								-0.002**
			(-4.52)								(-5.40)
AssetTangibility				0.045							0.029
				(1.32)							(0.76)
Sd(EBITDA)					0.154						-0.057
					(0.80)						(-0.24)
Sd(Return)						0.423***					0.476***
						(3.20)					(2.90)
NumAnalyst							0.002				0.001
							(1.32)				(1.00)
FcstDispersion								0.003			-0.011
								(0.20)			(-0.44)
FcstDeviation									0.005		0.004
									(1.22)		(0.81)
PayoutRatio										-0.008	-0.008
										(-1.12)	(-1.03)
Constant	1.101***	1.104***	1.151***	1.080***	1.094***	1.049***	1.163***	1.098***	1.145***	1.104***	1.058***
	(19.54)	(17.92)	(20.21)	(18.80)	(19.39)	(18.27)	(18.50)	(19.05)	(18.78)	(19.55)	(13.03)
Observation	6,543	6,543	6,543	6,543	6,543	6,543	5,725	6,543	5,588	6,543	5,586
Adjusted R^2	0.026	0.026	0.028	0.025	0.026	0.029	0.032	0.026	0.031	0.027	0.037
Industry-fixed	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 11: Determinants of Profit Expectation Coefficient: Panel Data

This table reports the panel data analysis in determining a firm's propensity to smooth dividend through leading channel (profit expectation coefficient, δ). All variables are defined in Appendix Table A1. Robust t-statistics adjusted for heteroskedasticity are reported in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% level respectively.

Panel A: Profit expectation coefficient (δ) (all samples)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Time Trend	-0.007***	-0.007***	-0.007***	-0.007***	-0.007***	-0.008***	-0.008***	-0.007***	-0.009***	-0.010***
	(-6.58)	(-6.55)	(-6.61)	(-6.58)	(-6.57)	(-6.93)	(-6.87)	(-6.46)	(-7.43)	(-7.47)
MA/BA	0.034***	0.035***	0.034***	0.031***	0.035***	0.033***	0.037***	0.033***	0.032***	0.030***
	(6.44)	(6.44)	(6.40)	(5.91)	(6.30)	(6.30)	(6.14)	(6.28)	(5.39)	(4.58)
StockTurnover	0.007	0.006	0.006	0.008	0.006	0.010*	0.001	0.005	0.004	0.008
	(1.19)	(1.09)	(1.11)	(1.46)	(1.19)	(1.75)	(0.25)	(0.92)	(0.70)	(1.27)
InstHolding	-0.205***	-0.205***	-0.198***	-0.212***	-0.213***	-0.208***	-0.196***	-0.221***	-0.219***	-0.205***
	(-9.11)	(-9.08)	(-8.22)	(-9.33)	(-9.39)	(-9.18)	(-7.47)	(-9.07)	(-8.68)	(-6.35)
Size		0.001								-0.003
		(0.23)								(-0.61)
FirmAge			-0.001							-0.001
			(-0.77)							(-1.31)
AssetTangibility				-0.036						0.001
				(-0.95)						(0.01)
Sd(EBITDA)					-0.029					0.054
					(-0.16)					(0.24)
Sd(Return)						-0.088**				-0.271*
						(-2.20)				(-1.72)
NumAnalyst							-0.001			-0.001
							(-1.07)			(-0.43)
FcstDispersion								-0.027		-0.006
								(-1.59)		(-0.26)
FcstDeviation									-0.008*	-0.007
									(-1.71)	(-1.25)
Constant	0.670***	0.664***	0.980***	0.560***	0.672***	0.705***	0.615***	0.690***	0.644***	0.721***
	(8.21)	(10.05)	(10.94)	(8.06)	(10.69)	(10.91)	(11.21)	(10.92)	(11.44)	(8.52)
Observation	6,543	6,546	6,543	6,543	6,543	6,543	5,725	6,543	5,588	5,597
Adjusted R^2	0.038	0.038	0.038	0.038	0.038	0.038	0.043	0.038	0.044	0.045
Industry-fixed	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 12: Dividend Smoothing and Earnings Persistence

This table reports the general relation between dividend smoothing and future earnings. We employ earnings persistence model (Richardson et al., 2005) by regressing future earnings (one-year ahead and two-year ahead return on assets, ROA) on current ROA after conditioning on ranked dividend smoothing measures ($Rank\_\delta_{it}$, $Rank\_SOA_{it}$).

Panel A: one-year ahead earnings Persistence

$$(E_{it+1}/TA_{it-1}) = \alpha_1 + \alpha_1 (E_{it}/TA_{it-1}) + \alpha_2 Rank\_SOA_{it} + \alpha_3 (E_{it}/TA_{it-1}) * Rank\_SOA_{it} + \epsilon_t$$

$$(E_{it+1}/TA_{it-1}) = \beta_0 + \beta_1 (E_{it}/TA_{it-1}) + \beta_2 Rank\_\delta_{it} + \beta_3 (E_{it}/TA_{it-1}) * Rank\_\delta_{it} + \mu_t$$

Panel B: two-year ahead earnings Persistence

$$(E_{it+2}/TA_{it-1}) = \theta_0 + \theta_1 (E_{it}/TA_{it-1}) + \theta_2 Rank\_SOA_{it} + \theta_3 (E_{it}/TA_{it-1}) * Rank\_SOA_{it} + \omega_t$$

$$(E_{it+2}/TA_{it-1}) = \sigma_0 + \sigma_1 (E_{it}/TA_{it-1}) + \sigma_2 Rank\_\delta_{it} + \sigma_3 (E_{it}/TA_{it-1}) * Rank\_\delta_{it} + \varepsilon_t$$

	Panel A: One year ahead earnings persistence (E_{it+1})			**Panel B: Two year ahead earnings persistence (E_{it+2})**		
Variable (expected sign)	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
(E_{it}/TA_{it-1}) (+)	0.607***	0.671***	0.493***	0.627***	0.599***	0.506***
	(11.60)	(9.33)	(5.38)	(22.30)	(10.12)	(10.11)
SOA_{it}		0.006			-0.0001	
		(1.51)			(-0.05)	
$(E_{it}/TA_{it-1})\ SOA_{it}$		-0.115			0.049	
		(-0.94)			(0.58)	
δ_{it}			-0.0060			-0.005
			(-1.32)			(-1.64)
$(E_{it}/TA_{it-1})\ \delta_{it}$ (+)			0.208*			0.213***
			(1.67)			(2.71)
Constant	0.029***	0.022***	0.032***	0.041***	0.041***	0.044***
	(6.61)	(3.85)	(6.88)	(3.28)	(3.14)	(3.52)
Observation	9,036	9,036	9,036	8,339	8,339	8,339
Adjusted R^2	0.316	0.317	0.319	0.258	0.258	0.260
Year-fixed	Yes	Yes	Yes	Yes	Yes	Yes
Year-fixed	Yes	Yes	Yes	Yes	Yes	Yes

Robust t-statistics adjusted for heteroskedasticity are reported in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% level respectively.