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The Pricing of Dividends in Equity Valuation

JOHN R. M. HAND AND WAYNE R. LANDSMAN*

Abstract: This study uses Ohlson's (1995 and 2001) accounting-based equity valuation model to structure tests of four explanations for the anomalously positive pricing of dividends reported by Rees (1997) and Fama and French (1998). First, we find that dividends are not simply a proxy for publicly available information that helps predict future abnormal earnings. Second, although dividends act as if they signal managers' private information about future profitability, they remain positively priced for firms with low incentives to signal. Third, dividends do not signal management's willingness to abstain from incurring agency costs. Fourth, however, controlling for one-year-ahead realized forecast errors yields a pricing of dividends that is very close to that of dividend displacement. After showing that dividends are not simply a proxy for analysts' misforecasting, we conclude that dividends appear to be positively priced because they are a proxy for the mispricing by investors of current earnings or book equity.

Keywords: accounting-based valuation, dividend displacement

1. INTRODUCTION

The role that dividends play in equity valuation has been studied for nearly half a century. Prominent in recent work is the finding that dividends are materially positively priced in the cross-section of

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Address for correspondence: John R. M. Hand, Professor, Kenan-Flagler Business School, McColl Building, UNC Chapel Hill, NC27599-3490, USA.
e-mail: hand@unc.edu

equity market values (Rees, 1997; Fama and French, 1998; Giner and Rees, 1999; and Akbar and Stark, 2003). This finding is anomalous because under the Modigliani and Miller dividend displacement theorem, firms' equity market values and dividends should be negatively related, dollar- for-dollar[1].

Utilizing the structure provided by Ohlson's (1995 and 2001) accounting-based equity valuation model, the goal of this study is to propose and test four explanations for the positive pricing of dividends. The advantage of the Ohlson equity valuation model is that it parameterizes the links between firms' net dividends, earnings, book value, other information and equity market values. In doing so, it yields both price-based and non-price-based avenues through which to assess the role(s) that dividends play in equity valuation.

The first explanation we investigate is that dividends are positively priced because they are simply a proxy for public information that helps predict future abnormal earnings beyond the autoregression of abnormal earnings, that is, v in the Ohlson model. Following Ohlson (2001), we measure v by subtracting the autoregressive forecast of one-year-ahead abnormal earnings from the abnormal earnings implied by consensus analyst forecasts of earnings. Our US data sample comprises NYSE, AMEX and NASDAQ firms in the period 1984–1995. Consistent with the proxy-for-v explanation, we find that dividends are positively correlated with v; do reliably help predict future abnormal earnings in the absence of v; but have no ability to predict one-year-ahead abnormal earnings after controlling for v. This suggests that the information in dividends about future abnormal earnings is entirely subsumed within the larger information set contained in analyst forecasts. However, contrary to the proxy-for-v explanation, dividends continue to be priced higher in a valuation context than dividend displacement after directly controlling for v.

The second and third explanations that we examine relax the assumption in the Ohlson model that information is symmetric between management and shareholders. We consider a profitability signaling hypothesis that posits that managers use

1 In particular, Miller and Modigliani (1961), Litzenberger and Ramaswamy (1979), Miller and Scholes (1982), Miller and Rock (1985) and Fama and French (1998).

dividends as a signal of their private information about the future profitability of the firm. We also evaluate an agency cost hypothesis that posits that managers pay dividends to signal that they are high-quality managers who are not going to extract personal benefits from firm profits at the expense of shareholders. Although each of these explanations predicts an incrementally positive relation between equity values and dividends beyond dividend displacement, we propose that dividends will be a stronger signal under the agency cost hypothesis when current profits are positive because there the firm's underlying free cash flows are likely to be higher and agency costs are likely to be more severe. In contrast, the profitability signaling hypothesis suggests that dividends will be a stronger signal when current earnings are negative, because then dividends are a more costly (and more credible) signal of future profitability relative to when earnings are positive.

We find that dividends are positively associated with future abnormal earnings in the absence of v, and reliably more so when current earnings are negative than when they are positive. This supports the profitability signaling explanation. However, because dividends are publicly observable, any private information they reveal should be fully captured in v. Therefore, controlling for v should yield dividend displacement in an equity valuation regression. Consistent with this prediction, we indeed find that dividends are not incrementally more predictive of future abnormal earnings when v is taken into account no matter whether current earnings are positive or negative, and dividend displacement is not rejected when current earnings are negative. However, the pricing of dividends remains larger than that predicted by dividend displacement when current earnings are positive (and earnings are positive for most of our sample).

The last explanation we explore is that dividends are either correlated with, or are a sufficient statistic for, analysts' misforecasting of future earnings or investors' mispricing of book equity or earnings. A growing body of work in accounting and finance suggests that analysts and investors may not fully incorporate all publicly available information into their forecasts of future earnings and current assessments of equity value. We test this explanation by examining whether dividends remain

positively priced in the presence of realized one-year-ahead analyst earnings forecast errors. If analysts' forecasts are rational and the stock market is efficient, then current equity values should be uncorrelated with future analysts' earnings forecast errors. We find that not only are one-year-ahead analyst earnings forecast errors reliably positively priced, but controlling for one-year-ahead analyst earnings forecast errors 'solves' the anomaly. That is, controlling for one-year-ahead analyst earnings forecast errors yields a pricing on dividends that is very close to what is predicted under dividend displacement. We also show that although analyst one-year-ahead earnings forecasts are biased, and dividends are positively associated with analyst one-year-ahead earnings forecast errors, controlling for dividends does not debias analysts' forecasts. Taken together, our results suggest that dividends are positively priced in Ohlson-type (1995 and 2001) price level regressions because they are correlated with investors' mispricing of book equity or earnings.

Overall, we conclude that explaining the positive pricing of dividends in the cross-section of US firms' equity values is possible, but in doing so it seems necessary to exchange one puzzle for another. Our suggested solution rests on the proposition that dividends are highly correlated with investor mispricing. As such, it deserves interest but also caution and concern. The need for caution arises because we have evaluated only four potential explanations for the anomaly, and only for US data between 1984 and 1995. Other hypotheses and datasets deserve scrutiny. For example, it might be that dividends are correlated with flaws in the assumed linear information dynamics that underpin the Ohlson model, or with omitted risk factors, or with the expected growth in long-term earnings, or tax factors, or the permanent component of earnings (Giner and Rees, 1999; and Akbar and Stark, 2003). It would also be worthwhile for future research to seek to replicate our findings in other countries and in other time periods. Our solution warrants concern because thousands of US firms pay dividends every quarter. This makes it challenging to believe that investors could be so imperfect in the presence of so repeated a signal. Nevertheless, studies such as Bernard and Thomas (1989 and 1990) conclude that investors seem to systematically misprice earnings, and earnings too are a regularly repeated and predictable action taken by firms. We therefore suggest that a potentially fruitful avenue to explore

would be to integrate our findings with behavioral finance theories of firms' dividend policies and managers' responses to stock mispricing (e.g., Shefrin and Statman, 1984; and Baker and Wurgler, 2004). We leave this exploration to future research.

The remainder of this paper proceeds as follows. Section 2 provides an overview of the Ohlson model, and summarizes the empirical literature that has found that dividends are materially positively priced. Section 3 outlines four explanations for this anomaly, together with the testable predictions that we suggest they generate. Section 4 describes the sample selection criteria and data. Section 5 outlines the empirical tests undertaken, while Section 6 concludes with some caveats and suggestions for future enquiry.

2. OHLSON'S EQUITY VALUATION MODEL AND THE POSITIVE PRICING OF DIVIDENDS

(i) The Ohlson Model

Ohlson's (1995 and 2001) accounting-based equity valuation model parameterizes the links between firms' net dividends, earnings, book values, other information and equity market values by integrating the dividend discount model with clean surplus accounting, modified first-order autoregressive linear information dynamics, the assumption of no information asymmetry, and market efficiency. The model starts from combining the dividend discount model (which typically assumes an economy with risk neutrality, homogeneous beliefs, non-stochastic interest rates, and a flat term structure) with clean surplus accounting to yield the residual income model:[2]

$$P_t = b_t + \sum_{\tau=1}^{\infty} R^{-\tau} E_t\left[\tilde{x}^a_{t+\tau}\right], \tag{1}$$

where P_t is equity market value at time t, b_t is equity book value at t, x_t is accounting earnings for period t, residual income or 'abnormal' earnings is given by $x_t^a \equiv x_t - rb_{t-1}$, r is the one-period risk-free return, and $R = 1 + r$.

2 Equation (1) assumes that the no-infinite-growth condition $E_t[b_{t+\tau}]/R^{\tau} \to 0$ as $\tau \to \infty$ is satisfied.

Ohlson (1995) builds on equation (1) by assuming that accounting is unbiased and abnormal profitability and information about future abnormal earnings that is not reflected in current book equity and earnings, v_t, evolve according to:

$$\widetilde{x}^a_{t+1} = \omega x^a_t + v_t + \widetilde{\varepsilon}_{1,t+1} \tag{2}$$

$$\widetilde{v}_{t+1} = \gamma v_t + \widetilde{\varepsilon}_{2,t+1}. \tag{3}$$

The parameters $0 \leq \omega \leq 1$ and $0 \leq \gamma < 1$ are fixed at t and determined by the firm's economic environment and accounting principles. Equation (2) models the reasonable economic condition that abnormal profits in expectation dissipate to zero over time, given that the evolution of abnormal earnings is unaffected by biases induced by conservative (aggressive) accounting that would result in understated (overstated) equity book values.[3] Equation (3) imposes a first-order autoregressive dynamic on v. Combining equations (1)–(3) yields the Ohlson (1995) model:

$$\mathrm{P}_t = (1-k)b_t + k(\varphi x_t - d_t) + \alpha_2 v_t, \tag{4}$$

where net dividends $d_t = \text{common dividends}_t + \text{capital outflows}_t - \text{capital inflows}_t$, and

$$\varphi = \mathrm{R}/(\mathrm{R}-1) > 0 \tag{4.1}$$

$$k = (\mathrm{R}-1)\omega/(\mathrm{R}-\omega), \quad \text{with} \quad 0 \leq k \leq 1 \tag{4.2}$$

$$\alpha_2 = \mathrm{R}/(\mathrm{R}-\omega)(\mathrm{R}-\gamma) > 0. \tag{4.3}$$

Although equation (4) is frequently applied in empirical settings by assuming that $v = 0$, Ohlson (2001) demonstrates from the assumed linear information dynamics that although v is not directly observable, it can be inferred from its influence on expectations. Thus, taking rational expectations at t of the first linear information dynamic equation (2) yields:

$$v_t = \mathrm{E}_t\left[\widetilde{x}^a_{t+1}\right] - \omega x^a_t. \tag{5}$$

3 Unbiased accounting obtains if unrecognized goodwill (the difference between equity market value and equity book value) is expected to tend to zero as time tends to infinity. Feltham and Ohlson (1995 and 1996) lift this restriction.

That is, v is next period's full information expectation of abnormal earnings less the purely autoregressive forecast of next period's abnormal earnings. If equation (5) is substituted into equation (4), equity market value can be re-expressed as:

$$P_t = \beta_1 b_t + \beta_2(\zeta x_t - d_t) + \beta_3 r^{-1} E_t[\widetilde{x}_{t+1}] \tag{6}$$

where:

$$\zeta \equiv Rr^{-1} \tag{6.1}$$

$$\Delta \equiv (R - \omega)(R - \gamma) \tag{6.2}$$

$$\beta_1 = R(1 - \omega)(1 - \gamma)\Delta^{-1} \geq 0 \tag{6.3}$$

$$\beta_2 = -r\omega\gamma\Delta^{-1} \leq 0 \tag{6.4}$$

$$\beta_3 = Rr\Delta^{-1} > 0 \tag{6.5}$$

(ii) The Pricing of Dividends in the Ohlson Model

The Ohlson model clearly displays the property of dividend displacement, namely that $\partial P_t/\partial d_t = -1$. This can be seen in equation (4) since $\partial b_t/\partial d_t = k - 1$ and $\partial x_t/\partial d_t = \partial v_t/\partial d_t = 0$, and in equation (6) since $\partial E_t[x_{t+1}]/\partial d_t = -r$ and $\beta_1 + \beta_2 + \beta_3 = 1$. The extent to which dividend displacement holds can therefore be assessed within the context of price-level regressions in two ways. The estimated coefficients on dividends in equations (4) and (6) can be compared with their predicted signs and point values, both of which depend on the information dynamics parameters ω and γ in equations (4.2) and (6.4). Alternatively, the partial derivative of equity market value with respect to dividends, $\partial P_t/\partial d_t$, can be compared with its predicted value of -1. This is the approach we adopt in our empirical tests. The term $\partial P_t/\partial d_t$ is a linear combination of the coefficients on book equity, dividends, forecasted next period earnings, and the discount rate, depending what assumptions are made about v. In a regression corresponding to equation (4) where $v = 0$, $\partial P_t/\partial d_t$ is the coefficient on dividends less the coefficient on book equity. Or, if v follows the modified AR(1) dynamics detailed in equations (2) and (3), then in a regression corresponding to equation (6), $\partial P_t/\partial d_t$ is

the coefficient on dividends less that on book equity, less the coefficient on forecasted next period earnings multiplied by R – 1.

(iii) Empirical Assessments of the Pricing of Dividends

In contrast to the Ohlson model's theoretical predictions, several studies have demonstrated that dividends do not displace firms' equity market values on a dollar-for-dollar basis—indeed, far from it. Using a variety of research questions, experimental designs and econometric specifications, Rees (1997), Fama and French (1998), Giner and Rees (1999) and Akbar and Stark (2003) all report that dividends are robustly and materially positively priced in the cross-section of the equity values of Spanish, UK, and US firms.[4]

Our goal is to investigate several potential explanations for this robust anomaly by utilizing the structure provided by the Ohlson model. The advantage of the Ohlson model is that it is rigorously derived from a set of plausible economic and financial assumptions. As such, it provides researchers with the benefits of an economically rooted and internally consistent structure through which to explore the relations between equity values and exogenous variables. As with all models, however, these benefits are accompanied by potential costs, particularly with regard to the extent to which empirical reality differs in inferentially substantive ways from the model's key assumptions. The explanations that we now turn to propose and test deliberately relax in turn the Ohlson model's key assumptions regarding publicly available other information v, information symmetry, analyst rationality, and market efficiency.

3. PROPOSED EXPLANATIONS FOR THE POSITIVE PRICING OF DIVIDENDS

(i) Dividends are Merely a Proxy for Other Information v

The Ohlson model is often applied by regressing stock price or equity market value on current book value and net income,

4 Rees (1997) uses annual UK per share data for the years 1988–1995. Fama and French (1998) use the level and change in annual asset-scaled US data for the years 1965–1992. Giner and Rees (1999) use annual per share Spanish data for the years 1986–1995. Akbar and Stark (2003) use annual UK data for the years 1991–2001 and multiple deflators (sales, shares, opening equity market value and closing book value).

without including other information v (e.g., Barth, Beaver and Landsman, 1998; and Barth, Beaver, Hand and Landsman, 1999). The first explanation we therefore investigate is that dividends are positively priced because they are simply a proxy for v. If so, then including dividends but not v in equity market value regressions leads to an omitted variable bias on the dividends coefficient. This possibility is investigated and not ruled out by Akbar and Stark (2003) for UK data using a less general (but larger sample-permitting) measure of v than that obtained using analysts earnings forecasts.[5]

We both augment and differ from Akbar and Stark's approach by noting that if the proxy-for-v explanation is correct, then [1] dividends should be positively correlated with v; [2] dividends should help predict future abnormal earnings when v is absent; but [3] dividends should not help to predict future abnormal earnings when v is included (see equation (2)). Moreover, the pricing of dividends should not differ from that implied by dividend displacement once v is included in the valuation regression (see equation (4)). Following Ohlson (2001), we measure v by subtracting the purely autoregressive forecast of one-year-ahead abnormal earnings from that implied by analysts' forecasts of one-year-ahead earnings. This estimate of v assumes that analysts make rational forecasts of one-year-ahead earnings.

(ii) Dividends are Signals of Managers' Private Information about Future Earnings

The Ohlson model assumes that there is no information asymmetry between managers and investors. However, a significant body of research in finance exists around the proposition that information asymmetries not only exist, but generate positive relations between the level and change in a firm's dividend and its equity returns (Bhattacharya, 1979; Kalay, 1980; and Miller and Rock, 1985). In the first paper we are aware of that documents the positive pricing of dividends in the cross-section of firm equity market values, Rees (1997) connects to the

5 Specifically, Akbar and Stark (2003) set v equal to the scale-adjusted residual in a regression of last year's equity value on book equity, earnings, R&D expense, dividends and contributed capital.

information asymmetry literature by asking if dividends are positively priced because they convey managers' privileged or private information about the quality and reliability of earnings and book values. Rees proposes that the positive pricing of dividends will be strongest where information asymmetry is most severe, which he argues will be in smaller firms and firms with extreme return on equity. He finds largely supportive evidence to this effect in his sample of UK firms for the years 1988–1995.

We build on Rees' analysis by analyzing US data and by refining Rees' argument via the more specific hypothesis that managers use dividends to credibly signal their private information about the trajectory of firm's future abnormal earnings. Four predictions emerge. First, in the absence of v, dividends will more strongly forecast future abnormal earnings the more costly—and therefore the more credible—is the dividend signal. Empirically, we use the sign of current period income as a proxy for the credibility of the dividend signal. Specifically, we propose that dividends will be a more credible signal of high future profitability when current earnings are negative than when current earnings are positive because when earnings are negative the firm is more likely to be in or heading toward financial distress (Altman, 1968). Firms in financial distress are less able to raise new capital than are healthy firms, making internal cash more valuable to them and hence the paying out of cash a more credible signal of future profitability.

Second, since dividends are publicly disclosed, if the signal in dividends is rationally incorporated into analysts' forecasts of future earnings, dividends will not predict future abnormal earnings no matter how credible is the dividend signal once v is included. The third prediction is that the partial derivative of equity market value with respect to dividends in a price level regression that excludes v will be increasing in the credibility of the dividend signal. Finally, in an equity market value regression that includes v, dividend displacement will hold regardless of the credibility of the dividend signal, if analysts are rational.

(iii) Dividends are Signals of Managers' Private Information about Agency Costs

A different kind of information asymmetry that may exist between managers and investors concerns the degree to which

managers can or will impose agency costs on the firm. Jensen (1986) proposes that managers with cash flow over that needed to fund normal investing activities ('free cash flow') may waste it by investing it in negative NPV projects or spending it on themselves rather than distributing it to shareholders. We therefore consider the situation where managers know more about their willingness, ability or intention to divert some of the firm's profits away from shareholders and into their own pockets or consumption streams. In such a situation, prior work has suggested that managers may use debt to signal their private information (Leland and Pyle, 1977; and Ross, 1977). We propose that an alternative to signaling through debt is signaling through dividends.

Under an agency cost hypothesis, the same types of prediction follow as in the profitability signaling hypothesis, except in the opposite directions. In the profitability signaling hypothesis, the credibility of signaling with dividends is high (low) when current income is negative (positive). We suggest that the reverse holds true for the agency cost hypothesis because when current profits are positive the firm's underlying free cash flows will be higher and investors' scrutiny of the firm may be lower. This should make agency costs higher and dividends a more costly, more credible signal for those managers who are high-quality agents and are not going to extract personal benefits from firm profits at the principals' expense (although presumably in equilibrium in exchange for larger 'above board' contracted compensation).

(iv) Dividends are Correlated with Analysts' Misforecasting of Earnings, and/or Investors' Mispricing of Book Equity or Earnings

The final explanation we explore is that dividends are positively priced because they are a proxy for (in the sense of being either correlated with, or sufficient statistics for) analysts' misforecasting of earnings and/or investors' mispricing of book equity or earnings information. A growing body of evidence in accounting and finance suggests that analysts and investors may not incorporate in a fully rational manner the implications that current accounting information has for the level and/or riskiness of the firms' future cash flows (e.g., O'Brien, 1988; Bernard and Thomas, 1989

and 1990; Abarbanell, 1991; Sloan, 1996; Debondt and Thaler, 1986; Daniel, Hirshleifer and Teoh, 2002; and Daniel and Titman, 2003). At this stage of the paper we do not advance any particular theory for why dividends might cause or be associated with analyst misforecasting or investor mispricing.

If investors are rational but analysts are not, and if dividends are a proxy for analysts' misforecasting of earnings, then [1] without controlling for dividends, analysts' forecasts should not be rational; [2] dividends should help forecast future earnings after controlling for analysts' forecasts; [3] controlling for dividends, analyst forecasts should be rational; and [4] the pricing of dividends should be equal to dividend displacement in an equity market valuation regression that controls for one-year-ahead actual earnings forecast errors.

Alternatively, if analysts are fully rational but investors are not, and if investors' mispricing is captured by dividends, then [1] not controlling for dividends, analysts' forecasts should be rational; [2] dividends should not help forecast future earnings after controlling for analysts' forecasts; and [3] the pricing of dividends should equal dividend displacement in an equity valuation regression that controls for one-year-ahead actual earnings forecast errors.

4. SAMPLE SELECTION AND DESCRIPTIVE STATISTICS

Data for the period 1984–1996 were taken from the *Compustat Primary, Secondary, and Tertiary, Full Coverage, and Research Annual Industrial Files*. We start our sample period in 1984 because that is the first year in which there are analyst forecasts of one-year-ahead earnings before extraordinary items available from I/B/E/S. We end our sample period before the 'bubble' period of 1998–2000. Basic logical checks were then applied. For example, price per share at fiscal year-end and the number of shares had to be positive, and cash dividends had to be non-negative. If a logical check was not met, the data item was set missing. Given the focus of the paper on the pricing of dividends, all firm-year observations where dividends were zero or missing were set aside and not used in our analysis.

This initial data set was then 'shrunk' by requiring that equity book value, income before extraordinary items, dividends, other net capital outflows, and one-year-ahead forecasted income before extraordinary items were all non-missing.[6] Because *Compustat* does not report the data items comprising net capital outflows for banks, life insurance, or property and casualty companies, such firms are excluded.

We estimate our regressions using undeflated variables measured in millions of dollars. Following Kothari and Zimmerman (1995), Collins, Maydew and Weiss (1997) and Fama and French (1998), we mitigate the effects of extreme outliers by deleting observations in the post-shrunk data set that were in their most positive or most negative one percentile in any given year. The final data set consists of 15,066 firm-year observations for NYSE, AMEX and NASDAQ firms over the period 1984–1995, an average of 1,256 per year. The constraint that there be an analyst forecast of one-year-ahead annual earnings biases our sample toward larger firms.

Table 1 defines the primary variables used in our study in terms of their *Compustat* data items. Following Collins, Maydew and Weiss (1997), our tests use income before extraordinary items (Compustat #18), NIBX, as the measure of earnings.[7] NIBX aims to capture firms' earnings before one-time, non-recurring items on an after-tax basis. We use NIBX instead of NI because we expect extraordinary items to be transitory and hence have a smaller pricing multiple than NIBX (Ohlson, 1999).[8] The market

6 The I/B/E/S forecast of one-year-ahead primary EPS before extraordinary items that was used was the one made closest to before the date that annual earnings for year t were reported. Thus, if year t ended 941231 and earnings for year t were reported on 950121, our forecast would be prior to 950121, e.g., 950114. If there was no report date for annual earnings in year t, we took the forecast closest to 3 months after the fiscal year end for year t, e.g., 950320.

7 We differ slightly from Collins, Maydew and Weiss (1997) in that we do not exclude firm-year observations for which equity book value is negative.

8 Unreported robustness tests indicate that additionally including one-time items in equity market value regressions has no material impact on coefficient estimates. Indeed, the coefficient on XITEM is always very close to zero. However, as NIBX excludes one-time items, it does not satisfy the clean surplus assumption of the Ohlson model. Pope and Wang (2004) show that strictly speaking, stripping out a component of earnings such as one-time items diminishes one's ability to test the Ohlson (1995) model by comparing or summing coefficients. This is a limitation of relying on the Ohlson (1995) model. Akbar and Stark (2003) adopt a more general model than Ohlson (1995) to evaluate the pricing of dividends that enables them to simply compare the estimated coefficient on dividends to zero. However, the greater generality comes with the tradeoff of less economic structure to the valuation model.

Table 1

Data Definitions

Variable	*Our Label*	*Ohlson Notation*	*Compustat Annual Data Items and Computation Details*
Market value common equity	MVE_t	P_t	199 (fiscal year-end closing price) × 25 (common shares outstanding at fiscal year-end).
Net income	NI_t	x_t	172 (net income or loss).
Core earnings	$NIBX_t$	–	18 (income before extraordinary items).
Extraordinary items	$XITEM_t$	–	$NI_t - NIBX_t$.
One-year-ahead core earnings	$NIBX_{t+1}$	–	When available.
Forecasted one-year-ahead core earnings	$FNIBX_{t+1}$	$E_t[x_{t+1}]$	[From I/B/E/S] Forecast of primary EPS before extraordinary items for year $t+1$ × common shares at the time the forecast was made. The latter is the date of the forecast made closest to before the date that annual earnings for year t were reported. Thus, if year t ended 941231 and earnings for year t were reported on 950121, our forecast would be prior to 950121, e.g., 950114. If there was no report date for annual earnings in year t, we took the forecast closest to 3 months after the fiscal year end for year t, e.g., 950320.
One-year-ahead forecast error	$UNIBX_{t+1}$	–	$NIBX_{t+1} - FNIBX_{t+1}$.
Book value of common equity	BVE_t	b_t	60 (total common equity).
Common dividends	DIV_t	1st part of d_t	21 (common dividends declared).
Net capital contributions	$NETCAP_t$	2nd part of d_t	115 (purchase of common + preferred stock) − 108 (sale of common and preferred stock). Note that $d_t = DIV_t + NETCAP_t$.
Dirty surplus items	$DIRT_t$	–	$BVE_t - BVE_{t-1} - NI_t + DIV_t + NETCAP_t$. To allow for rounding errors, $DIRT_t = 0$ if abs{$DIRT_t$} < \$10,000.

value of common equity is computed at the fiscal year-end. The measure of net capital contributions, NETCAP, is not exact because per *Compustat*'s data definition it unavoidably includes the issuance and repurchase of preferred in addition to common stock. However, it is important to note that NETCAP excludes DIV and that the sum of NETCAP and DIV equals net dividends.

Panels A and B of Table 2 report descriptive statistics for the key variables. Panel A shows year-by-year means together with certain percentages. We report descriptive statistics based on year-by-year computations because our tests of regression coefficients are based on the Fama-MacBeth (1973) approach for assessing statistical significance using a time-series of cross-sections. The number of usable observations per firm-year does not vary greatly over the sample period, being 1,083 in 1984 and 1,290 in 1995. Time trends in the data include a tripling in the mean nominal MVE, a doubling in the mean NIBX, BV and DIV. None of the variables XITEM, NETCAP and DIRT display systematically increasing or decreasing behavior.

Panel A also shows that between 14% and 34% of firms have extraordinary items in any given year. Unlike the findings in Hayn (1995), few of our sample firms have losses as defined by negative NIBX. This is most likely because analysts choose to predominantly follow and forecast the earnings of consistently profitable companies. The percentage of firms with dirty surplus items DIRT averages 83%. Panel B of Table 2 reports distributional statistics covering all observations. Almost all variables are substantially skewed in that means are substantially larger than medians. Panel C reports the industry composition of our sample. We employ the same industry classifications as Barth, Beaver and Landsman (1998), based on the primary SIC code reported by *Compustat*. As might be expected, the industries with the largest concentrations of firm-year observations are durable manufacturers, utilities, retailers and textiles.[9]

Panel D provides a year-by-year comparison of the means of the market value of equity, income before extraordinary items

9 Reflecting the fact that *Compustat* does not report the data items comprising net capital outflows for banks, life insurance, or property and casualty companies, the fraction of firm-year observations represented by financial institutions (#12) and insurance companies (#13) is lower than in the population.

Table 2

Descriptive Statistics for the Sample of Dividend-paying US Firm-years, 1984–1995[a]

Panel A: Year-by-year Means (in $ millions) and Percentages[b]

Year	*No. Obs.*	MVE_t	$NIBX_t$	$FNIBX_{t+1}$	$XITEM_t$	BVE_t	DIV_t	$NETCAP_t$	$DIRT_t$	$XITEM_t \neq 0$	$NIBX_t < 0$	$BVE_t < 0$	$DIRT_t \neq 0$
1984	1,083	$ 779	$ 77	$ 88	$ −0.3	$ 583	$ 33	$ −2.2	$ −13.6	18%	4%	0.0%	83%
1985	1,246	910	64	78	−2.1	545	31	−3.3	5.9	20	8	0.0	80
1986	1,224	1,107	70	86	1.7	574	35	−4.8	7.8	21	9	0.0	78
1987	1,194	1,203	94	106	1.1	678	40	3.2	6.6	25	4	0.0	78
1988	1,253	1,195	105	113	2.2	666	40	6.8	−2.3	24	5	0.0	78
1989	1,301	1,521	110	120	3.4	743	48	1.1	−15.4	18	5	0.2	80
1990	1,263	1,481	110	119	0.4	839	52	9.4	17.2	15	6	0.0	82
1991	1,257	1,779	95	116	−4.5	864	53	−7.3	2.3	19	9	0.0	84
1992	1,287	1,813	97	116	−26.9	837	51	−11.6	−14.8	34	8	0.0	87
1993	1,324	1,994	100	123	−9.8	869	52	−15.4	1.4	36	7	0.0	88
1994	1,344	2,038	131	154	−3.0	944	59	2.1	−0.8	17	4	0.0	90
1995	1,290	2,610	157	178	−7.6	1,074	64	9.4	32.8	14	6	0.0	91

Panel B: Distributional Statistics Covering all Observations ($n = 15{,}066$)

Variable (in $ millions)	*Label*	*Min.*	*Lower Quartile*	*Median*	*Mean*	*Upper Quartile*	*Max.*
Market value of equity	MVE_t	$ 2[c]	$ 142	$ 445	$ 1,555	$ 1,495	$ 44,286
Core earnings	$NIBX_t$	−298	8	26	102	96	2,529
One-year-ahead forecast	$FNIBX_{t+1}$	−246	11	33	117	110	2,881
One-year-ahead core earnings	$NIBX_{t+1}$	−337	7	27	107	102	2,834
Extraordinary items	$XITEM_t$	−3,360	0	0	−4	0	1,454
Book value of common equity	BVE_t	−22	84	236	773	762	16,422
Dividends declared	DIV_t	0.1	3	10	47	41	1,330
Net capital contributions	$NETCAP_t$	−660	−3	−0.1	−1	1	662
Dirty surplus items	$DIRT_t$	−6,603	−1	0	2	3	3,787

Panel C: Industry Composition

No.	*Industry*	*Primary SIC Codes*	*No. Obs.*	*% Obs.*
1.	Mining and construction	1000–1999 (excl. 1300–1399)	449	3.0%
2.	Food	2000–2111	606	4.0
3.	Textiles, printing/publishing	2200–2780	1,532	10.2
4.	Chemicals	2800–2824, 2840–2899	725	4.8
5.	Pharmaceuticals	2830–2836	250	1.7
6.	Extractive industries	2900–2999, 1300–1399	567	3.8
7.	Durable manufacturers	3000–3999 (excl. 3570–3579, 3670–3679)	3,635	24.1
8.	Computers	7370–7379, 3570–3579, 3670–3679	391	2.6
9.	Transportation	4000–4899	784	5.2
10.	Utilities	4900–4999	1,769	11.7
11.	Retail	5000–5999	1,652	11.0
12.	Financial institutions	6000–6411	1,472	9.8
13.	Insurance and real estate	6500–6999	396	2.6
14.	Services	7000–8999 (excl. 7370–7379)	838	5.6
		TOTAL	15,066	100.0%

Table 2 (Continued)

Panel D: Comparison of Year-by-year Means as the Sample is Restricted from all Observations to those with Positive Dividends, to those with Positive Dividends and an Analyst's One-year Ahead Earnings Forecast (all figures in $ millions)

	Unrestricted Sample				*DIV > 0*				*DIV > 0 and Analyst Forecast*			
Year	*No. Obs.*	MVE_t	$NIBX_t$	DIV_t	*No. Obs.*	MVE_t	$NIBX_t$	DIV_t	*No. Obs.*	MVE_t	$NIBX_t$	DIV_t
1984	4,923	$ 332	$ 31	$ 13	2,118	$ 712	$ 72	$ 30	1,083	$ 779	$ 77	$ 33
1985	4,925	410	27	14	2,034	903	67	33	1,246	910	64	31
1986	5,117	482	25	15	1,954	1,133	70	40	1,224	1,107	70	35
1987	5,244	502	34	17	1,932	1,240	92	45	1,194	1,203	94	40
1988	5,074	541	40	20	1,882	1,323	107	53	1,253	1,195	105	40
1989	4,939	711	45	22	1,883	1,694	119	56	1,301	1,521	110	48
1990	4,874	675	41	22	1,813	1,659	116	60	1,263	1,481	110	52
1991	5,048	825	34	23	1,812	2,052	99	63	1,257	1,779	95	53
1992	5,343	832	34	21	1,879	2,084	100	60	1,287	1,813	97	51
1993	5,795	930	37	21	2,001	2,290	107	61	1,324	1,994	100	52
1994	6,193	922	49	22	2,073	2,313	140	65	1,344	2,038	131	59
1995	6,699	1,086	53	23	2,144	2,781	157	73	1,390	2,610	157	64

Notes:
[a] Variable definitions are per Table 1. For a firm year to be included, the following variables all had to be non-missing: MVE, BVE, NIBX, DIV, NETCAP and FNIBX.
[b] Positive values of NIBX, FNIBX, XITEM, BVE and DIRT are credits. Positive values of DIV and NETCAP are debits.
[c] Numbers are rounded to the nearest $1 million unless the number is less than $1 million.

and dividends in the annual cross-sections that we use in our study versus two populations: all firms (with no dividend or analyst forecast restrictions), and dividend-paying firms only. Panel D indicates that our limiting of our sample to dividend-paying firms doubles or even trebles the average firm market value of equity, income before extraordinary items and dividends. Additionally requiring a one-year-ahead analyst earnings forecast has little or no effect on these means.

5. EMPIRICAL METHODS AND RESULTS

(i) The Pricing of Dividends in the Cross-section of Equity Market Values in the Absence of v

We begin our empirical analysis by confirming for US firms Rees' (1997) finding for UK firms that dividends are positively priced in the cross-section of equity market values, controlling for current earnings and book equity. We employ the following type of regression:

$$\mathrm{MVE}_{it} = c_{0t} + c_{1t}\mathrm{BV}_{it} + c_{2t}\mathrm{NIBX}_{it} + c_{3t}\mathrm{DIV}_{it} + c_{4t}\mathrm{NETCAP}_{it} + e_{it}. \quad (7)$$

Equation (7) is the empirical analog to equation (4) where v is restricted to be zero.

As discussed in Section 2(*ii*), an attractive feature of the Ohlson model is that it permits the pricing of dividends in equation (7) to be calibrated in two different ways. The first is through the coefficient c_3 on DIV, which is predicted to be negative. The second is through the estimated partial derivative of equity market value with respect to dividends, denoted $\partial\mathrm{MVE}/\partial\mathrm{DIV}$, which under dividend displacement should equal -1. We note, however, that these benefits come with a price. For example, the Ohlson model assumes that accounting is unbiased. To the extent this is misplaced, estimated coefficients on book equity and income may be distorted.[10]

10 For example, several studies in the US show that R&D and advertising expenditures have valuation multiples that reliably differ from those on other expenses because of the conservative bias in US GAAP that disallows such expenditures to be capitalized and amortized over time. As a result, restricting the coefficients on all expenses to be the same, as in equation (7), may distort the researcher's inferences.

We estimate equation (7) on an annual basis including industry fixed effects. As a result, c_0 denotes a set of industry-specific intercepts.[11] Because 1984 is the first year that I/B/E/S forecasts are available, our data comprise 12 annual cross-sections. Following Fama and French (1998), we report mean coefficients and associated *t*-statistics from regressions using these annual cross-sections rather than coefficients from pooled time-series cross-sectional regressions. The latter typically suffer from a lack of independence in the residuals that leads to substantially understated standard errors on estimated coefficients. Regressions are estimated using unscaled data expressed in millions of dollars. Although unscaled data are heteroscedastic, year-by-year estimation should yield a series of unbiased regression coefficient estimates if the parameters in the underlying model are not a function of the market value of equity (Barth and Kallapur, 1996).

Table 3 reports the results of estimating equation (7) on our sample of dividend-paying US firm-year observations. Contrary to Miller and Modigliani's displacement property, but consistent with the findings of Rees (1997), Fama and French (1998), Giner and Rees (1999) and Akbar and Stark (2003), we infer that dividends are reliably positively priced in the cross-section of US firms' equity market values. The estimated coefficient on DIV of 3.47 is reliably positive (*t*-statistic = 4.3) and the estimated ∂MVE/∂DIV of 2.87 is reliably more positive than its predicted value of -1 (*t*-statistic = 4.9). We also note that net capital contributions are reliably positively priced, although less so than dividends. The estimated coefficient on NETCAP of 0.90 is reliably positive (*t*-statistic = 2.4) and the estimated ∂MVE/∂NETCAP of 0.30 is reliably more positive than its predicted value of -1 (*t*-statistic = 3.4).[12]

11 Inferences do not materially change when industry fixed effects are omitted. However, their inclusion generally yields lower standard errors on the estimated slope coefficients.

12 Our estimated coefficient of 3.47 on dividends is substantially smaller than the 12.68 estimate in Rees (1997) and the 10.50 to 16.80 estimates in Akbar and Stark (2003). At the same time, our estimated coefficient on net income of 7.11 is substantially larger than the 2.36 estimate in Rees (1997) and the 0.52 to 1.93 estimates in Akbar and Stark (2003). These differences most likely reflect the fact that our data requirement of there being analyst forecasts available for a firm to be included in our sample restricts our sample to much larger firms that those in Rees' and Akbar and Stark's samples. Larger firms will tend to have more established dividends and more permanent streams of earnings than small firms.

Table 3

Mean Coefficients and Associated Fama-MacBeth *t*-statistics from Annual Cross Sectional OLS Regressions of the Market Value of Common Equity on the Independent Variables from Ohlson's (1995) Accounting-based Valuation Model where Other Information v is Restricted to be Zero (Data are dividend paying US firm-year observations only, 1984–1995[a])

Panel A: Correlations: Pearson (Spearman) Correlations are Above (Below) the Diagonal[b]

Variable	MVE_t	BVE_t	$NIBX_t$	DIV_t	$NETCAP_t$
MVE_t		0.85**	0.89**	0.80**	0.12**
BVE_t	0.93**		0.86**	0.81**	0.05
$NIBX_t$	0.87**	0.83**		0.82**	0.12**
DIV_t	0.86**	0.87**	0.79**		0.05
$NETCAP_t$	0.01	0.02	0.04	0.03	

Panel B: Pricing of Dividends in the Absence of Other Information

$$MVE_{it} = c_{0t} + c_{1t}\mathrm{BVE}_{it} + c_{2t}\mathrm{NIBX}_{it} + c_{3t}DIV_{it} + c_{4t}\mathrm{NETCAP}_{it} + e_{it}$$

Estimated Coefficients						
c_1	c_2	c_3	c_4	*Mean Adj.* R^2	$\partial MVE/\partial DIV$[c]	$\partial MVE/\partial NETCAP$[d]
0.69[e]	8.06			84%		
(9.5)[f]	(16.5)					
0.61	7.11	3.47	0.90	84%	2.87	0.30
(10.0)	(18.0)	(4.3)	(2.4)		[4.9][g]	[3.4]

Notes:

[a] Variable definitions are per Table 1. For a firm year to be included, the following variables all had to be non-missing: MVE, BVE, NIBX, DIV, NETCAP and FNIBX. Industry dummies are included but their coefficient estimates are not reported.

[b] Each correlation is the mean of the individual yearly correlations. Single and double asterisks denote that the *t*-statistic on the mean correlation is reliably different from zero under a two-tailed test at the 5% and 1% levels, respectively.

[c] Dividend displacement predicts that $\partial \mathrm{MVE}/\partial \mathrm{DIV} = -1 = c_3 - c_1$.

[d] Net capital contributions displacement predicts that $\partial \mathrm{MVE}/\partial \mathrm{NETCAP} = -1 = c_4 - c_1$.

[e] Mean year-by-year coefficient estimate.

[f] *t*-statistics versus a null of zero are in (.) and are based on the standard error of year-by-year coefficient estimates.

[g] *t*-statistics versus a null of −1 are in [.] and are based on the standard error of year-by-year coefficient estimates.

(ii) Tests of the Predictions of the Proposed Explanations for the Positive Pricing of Dividends

(a) The Proxy-for-v Explanation

Table 4 reports the results of testing the predictions made by the hypothesis that dividends are positively priced in the cross-section of firms' equity values because dividends are merely a proxy for other information v. To recall, these predictions are that dividends should be positively correlated with v; dividends should help to predict future abnormal earnings in the absence of v; dividends should not help to predict future abnormal earnings when v is included; and that the pricing of dividends should equal dividend displacement when the equity market value regression estimated in Table 3 is adjusted to include v.

The first result is found in Panel A of Table 4 that shows that as predicted, dividends are positively correlated with v. The Pearson and Spearman correlations between dividends and v are 0.31 and 0.23, respectively, and are highly significant. Net capital contributions are also reliably positively correlated with v, although the magnitudes of the correlations are much smaller.

Second, Panel B reports the results of estimating the parameters governing the evolution of abnormal one-year-ahead abnormal earnings.[13] We expand the theoretical specification defined in equation (2) by allowing abnormal earnings to be second-order autoregressive and by including a control for the effects of conservative accounting on abnormal earnings in the form of lagged book equity (e.g., Feltham and Ohlson, 1995 and 1996).[14] As predicted by the proxy-for-v explanation, dividends (and net capital contributions) are reliably positively correlated with one-year-ahead abnormal earnings when v is excluded from the equity market value regression, but are not reliably positively correlated when v is included. Beyond dividends, as expected from the economics of competition and prior empirical studies

13 Strictly speaking, v and the parameters describing the evolution of abnormal earnings (particularly ω_1) should be jointly estimated. However, unreported sensitivity tests indicate that inferences are not sensitive to locally varying the value of ω_1.

14 For example, expensing rather than capitalizing and amortizing R&D is conservative accounting that depresses current earnings and book equity but increases future earnings.

Table 4

Tests of the Proxy-for-v Explanation for the Positive Pricing of Dividends in Equity Market Values
(Data are dividend paying US firm-year observations only, 1984–1995[a])

Panel A: Correlations: Pearson (Spearman) Correlations are Above (Below) the Diagonal[b]

Variable	$ANIBX_{t+1}$	$ANIBX_t$	$ANIBX_{t-1}$	v_{t+1}	v_t	DIV_t	$NETCAP_t$	BVE_{t-1}
$ANIBX_{t+1}$		0.62**	0.46**	0.06	0.33**	0.29**	0.11**	0.13**
$ANIBX_t$	0.64**		0.62**	0.22**	0.08	0.32**	0.15**	0.13**
$ANIBX_{t-1}$	0.50**	0.65**		0.19**	0.20**	0.34**	0.17**	0.18**
v_{t+1}	0.11**	0.22**	0.22**		0.56**	0.32**	0.09**	0.25**
v_t	0.31**	0.11**	0.21**	0.44**		0.31**	0.10**	0.24**
DIV_t	0.27**	0.31**	0.34**	0.23**	0.23**		0.05	0.83**
$NETCAP_t$	0.04*	0.03	0.06*	0.08**	0.12**	0.03		0.09
BV_{t-1}	0.18**	0.21**	0.26**	0.19**	0.19**	0.89**	0.04	

Panel B: Evolution of Abnormal Earnings[c]

$$ANIBX_{i,\ t+1} = \omega_{0t} + \omega_{1t}ANIBX_{it} + \omega_{2t}ANIBX_{i,t-1} + \omega_{3t}\, v_{it} + \omega_{4t}DIV_{it} + \omega_{5t}NETCAP_{it} + \omega_{6t}BVE_{i,t-1} + \varepsilon_{it}$$

Estimated Coefficients						
ω_1	ω_2	ω_3	ω_4	ω_5	ω_6	*Mean Adj.*R^2
0.63[d]	0.19					43%
(12.7)[e]	(2.8)					
0.57	0.18		0.22	0.06	−0.01	48%
(12.5)	(3.3)		(2.5)	(2.4)	(−1.4)	
0.67	0.07	0.46				52%
(16.5)	(1.1)	(8.1)				
0.67	0.11	0.45	0.09	0.03	−0.01	55%
(20.6)	(1.8)	(9.2)	(1.3)	(1.3)	(−1.4)	

Table 4 (Continued)

Panel C: Evolution of Other Information[c]

$$v_{i,t+1} = \gamma_{0t} + \gamma_1 v_{it} + \gamma_2 \mathrm{DIV}_{it} + \gamma_3 \mathrm{NETCAP}_{it} + n_{it}$$

Estimated Coefficients			
γ_1	γ_2	γ_3	*Mean Adj.*R^2
0.48	0.14	0.01	33%
(7.4)	(4.3)	(0.8)	

Panel D: Pricing of Dividends in the Presence of Other Information[c]

$$\mathrm{MVE}_{it} = c_{0t} + c_{1t}\mathrm{BVE}_{it} + c_{2t}\mathrm{NIBX}_{it} + c_{3t}\mathrm{DIV}_{it} + c_{4t}\mathrm{NETCAP}_{it} + c_{5t}v_{it} + c_{6t}\mathrm{FNIBX}_{i,t+1} + e_{it}$$

Estimated Coefficients								
c_1	c_2	c_3	c_4	c_5	c_6	*Mean Adj.*R^2	$\partial MVE/\partial DIV$[f]	$\partial MVE/\partial NETCAP$[g]
0.61	7.94	0.47	0.14	6.37		87%	−0.14	−0.47
(5.5)	(9.8)	(4.4)	(1.9)	(11.9)			[2.2][h]	[1.4]
0.37	2.88	1.67	0.66		6.25	87%	0.55	−0.45
(5.5)	(9.8)	(4.4)	(1.9)		(11.9)		[4.4]	[1.5]

Notes:

[a] Variable definitions are per Table 1. For a firm year to be included, the following variables all had to be non-missing: MVE, BVE, NIBX, DIV, NETCAP and FNIBX.

[b] Abnormal earnings $\mathrm{ANIBX}_t = \mathrm{NIBX}_t - (r \times \mathrm{BVE}_{t-1})$, where $r = 0.12$. Other information $v_t = \mathrm{FNIBX}_{t+1} - (r \times \mathrm{BVE}_t) - (\omega_1 \times \mathrm{ANIBX}_t)$. The parameter ω_1 is set to 0.67. Each correlation is the mean of the individual yearly correlations. Single and double asterisks denote that the *t*-statistic on the mean correlation is reliably different from zero under a two-tailed test at the 5% and 1% levels, respectively.

[c] Industry dummies are included but their coefficient estimates are not reported.

[d] Mean year-by-year coefficient estimate.

[e] *t*-statistics versus a null of zero are in (.) and are based on the standard error of year-by-year coefficient estimates.

[f] When other information is included in the regression through the term v_t, dividend displacement predicts that $\partial\mathrm{MVE}/\partial\mathrm{DIV} = -1 = c_3 - c_1$. When other information is included in the regression through the term FNIBX_{t+1}, dividend displacement predicts that $\partial\mathrm{MVE}/\partial\mathrm{DIV} = -1 = c_3 - c_1 - (c_6 \times r)$.

[g] When other information is included in the regression through the term v_t, net capital contributions displacement predicts that $\partial\mathrm{MVE}/\partial\mathrm{NETCAP} = -1 = c_4 - c_1$. When other information is included in the regression through the term FNIBX_{t+1}, dividend displacement predicts that $\partial\mathrm{MVE}/\partial\mathrm{NETCAP} = -1 = c_4 - c_1 - (c_6 \times r)$.

[h] *t*-statistics versus a null of −1 are in [.] and are based on the standard error of year-by-year coefficient estimates.

(e.g., Dechow, Hutton and Sloan, 1999), abnormal earnings are positively autocorrelated. However, although the coefficient on v is reliably positive, it is also reliably smaller than one, the predicted value in equation (2). The result in Panel C suggests that this may be because contrary to the prediction of equation (2), dividends help to predict one-year-ahead v.

Third, the results in Panel D show that controlling for v does *not* result in dividends being priced according to dividend displacement. If v is included directly as an additional explanatory variable per equation (4), $\partial \text{MVE}/\partial \text{DIV} = -0.14$ (t-statistic relative to the null of $-1 = 2.2$, one-tailed p-value $= 0.03$). If v is addressed indirectly through incorporating one-year-ahead forecasted earnings as an additional explanatory per equation (6), $\partial \text{MVE}/\partial \text{DIV} = 0.55$ (t-statistic relative to the null of $-1 = 4.4$). However, the news in Panel D is not all bad in that displacement is not rejected for net capital contributions. These results therefore suggest that although dividends are positively priced because they are not merely a proxy for v, the proxy-for-v explanation does seem to apply to net capital contributions.

(b) The Profitability Signaling and Agency Cost Signaling Explanations

Table 5 reports the results of tests designed to evaluate the predictions developed in Sections 3(*ii*) and 3(*iii*) concerning the profitability signaling and agency cost signaling explanations for the positive pricing of dividends. To recall, the signaling explanations argue that: [1] In the absence of v, dividends will more strongly forecast future abnormal earnings the more credible is the dividend signal; [2] Since dividends are publicly disclosed, then if the signal in dividends is rationally incorporated into analysts' forecasts of future earnings, dividends will not predict future abnormal earnings no matter how credible is the dividend signal; [3] The partial derivative of equity market value with respect to dividends in a price level regression that excludes v will be increasing in the credibility of the dividend signal; and [4] The coefficient on dividends in an equity market value regression that includes v will be zero regardless of the credibility of the dividend signal, if analysts are rational.

Table 5

Tests of the Profitability Signaling and Agency Cost Signaling Explanations for the Positive Pricing of Dividends in Equity Market Values
(Data are dividend paying US firm-year observations only, 1984–1995[a])

Panel A: Evolution of Abnormal Earnings[b]

$$\mathrm{ANIBX}_{i,t+1} = \omega_{0t} + \omega_{1t}\mathrm{ANIBX}_{it} + \omega_{2t}\mathrm{ANIBX}_{i,\,t-1} + \omega_{3t}v_{it} + \omega_{4t}\mathrm{DIV}_{it} + \omega_{5t}\mathrm{NETCAP}_{i,\,t} + \omega_{6t}\mathrm{BVE}_{i,\,t-1} + \varepsilon_{it}$$

	Estimated Coefficients						
Data Partition	ω_1	ω_2	ω_3	ω_4	ω_5	ω_6	*Mean Adj.*R^2
$\mathrm{NIBX}_t > 0$	0.64[c]	0.17		0.19	0.06	−0.01	49%
	(14.2)[d]	(2.9)		(2.2)	(2.3)	(−1.3)	
$\mathrm{NIBX}_t < 0$	0.26	−0.14		0.93	0.24	−0.08	55%
	(0.9)	(−0.9)		(2.4)	(1.0)	(−1.1)	
$\mathrm{NIBX}_t > 0$	0.70	0.10	0.44	0.08	0.03	−0.01	55%
	(20.4)	(1.7)	(8.7)	(1.1)	(1.2)	(−1.4)	
$\mathrm{NIBX}_t < 0$	0.95	−0.26	0.84	−0.27	0.17	0.03	68%
	(4.4)	(−1.9)	(3.1)	(−0.8)	(0.5)	(0.5)	

Panel B: Pricing of Dividends in the Presence of Other Information

$$\mathrm{MVE}_{it} = c_{0t} + c_{1t}\mathrm{BVE}_{it} + c_{2t}\mathrm{NIBX}_{it} + c_{3t}\mathrm{DIV}_{it} + c_{4t}\mathrm{NETCAP}_{it} + c_{5t}v_{it} + c_{6t}\mathrm{FNIBX}_{i,\,t+1} + e_{it}$$

	Estimated Coefficients								
Data Partition	c_1	c_2	c_3	c_4	c_5	c_6	*Mean Adj.*R^2	$\partial MVE/\partial DIV$ [e]	$\partial MVE/\partial NETCAP$ [f]
$\mathrm{NIBX}_t > 0$	0.54	7.92	2.94	0.86			85%	2.40	0.32
	(9.3)	(17.7)	(3.9)	(2.2)				[4.6][g]	[3.4]
$\mathrm{NIBX}_t < 0$	1.04	−1.16	4.51	−0.35			81%	3.46	−1.39
	(5.2)	(−2.5)	(1.9)	(−0.5)				[1.7]	[−0.4]
$\mathrm{NIBX}_t > 0$	0.55	8.51	0.26	0.15	6.07		87%	−0.30	−0.41
	(9.0)	(25.6)	(0.7)	(0.4)	(8.0)			[1.9]	[1.5]
$\mathrm{NIBX}_t < 0$	1.01	3.15	0.87	−0.16	5.53		89%	−0.14	−1.17
	(5.7)	(2.8)	(0.3)	(−0.3)	(4.4)			[0.3]	[−0.2]
$\mathrm{NIBX}_t > 0$	0.33	3.49	1.48	0.68		6.01	87%	0.42	−0.38
	(4.9)	(8.4)	(4.1)	(1.9)		(11.1)		[4.3]	[1.6]
$\mathrm{NIBX}_t < 0$	0.79	−1.16	−0.14	−0.16		6.02	87%	−1.64	−1.67
	(5.6)	(−2.1)	(−0.1)	(−0.3)		(4.1)		[−0.2]	[−1.0]

Notes:

[a] Variable definitions are per Table 1. For a firm year to be included, the following variables all had to be non-missing: MVE, BVE, NIBX, DIV, NETCAP and FNIBX. Industry dummies are included but their coefficient estimates are not reported.

[b] Abnormal earnings $\mathrm{ANIBX}_t = \mathrm{NIBX}_t - (r \times \mathrm{BVE}_{t-1})$, where $r = 0.12$. Other information $v_t = \mathrm{FNIBX}_{t+1} - (r \times \mathrm{BVE}_t) - (\omega_1 \times \mathrm{ANIBX}_t)$. The parameter ω_1 is set to 0.67. Industry dummies are included but their coefficient estimates are not reported.

[c] Mean year-by-year coefficient estimate.

[d] *t*-statistics versus a null of zero are in (.) and are based on the standard error of year-by-year coefficient estimates.

[e] When other information is included in the regression via the term v_t, dividend displacement predicts that $\partial\mathrm{MVE}/\partial\mathrm{DIV} = -1 = c_3 - c_1$. When other information is included in the regression via the term FNIBX_{t+1}, dividend displacement predicts that $\partial\mathrm{MVE}/\partial\mathrm{DIV} = -1 = c_3 - c_1 - (c_6 \times r)$.

[f] When other information is included in the regression via the term v_t, net capital contributions displacement predicts that $\partial\mathrm{MVE}/\partial\mathrm{NETCAP} = -1 = c_4 - c_1$. When other information is included in the regression via the term FNIBX_{t+1}, dividend displacement predicts that $\partial\mathrm{MVE}/\partial\mathrm{NETCAP} = -1 = c_4 - c_1 - (c_6 \times r)$.

[g] *t*-statistics versus a null of −1 are in [.] and are based on the standard error of year-by-year coefficient estimates.

We test these predictions using the sign of current period income before extraordinary items, $NIBX_t$, as a simple proxy for the credibility of the dividends signal. For the profitability signaling explanation, we propose that paying dividends when a firm is experiencing negative income is more costly and therefore more credible than paying dividends when the firm is reporting positive income. However, we propose the reverse for the agency cost signaling explanation—paying dividends when a firm is experiencing negative income is less costly and therefore less credible than paying dividends when the firm is reporting positive income. This is why Table 5 partitions the data based on the sign of $NIBX_t$.

Panel A reports conditioning the estimation of the evolution of abnormal earnings based on positive versus negative $NIBX_t$. The results are consistent with the profitability signaling explanation but inconsistent with the agency cost signaling explanation. Both dividends and net capital contributions are incrementally and positively associated with one-year-ahead abnormal earnings, but only in the absence of v. In the absence of v, the coefficient on dividends is reliably positive regardless of the sign of $NIBX_t$, and almost five times larger when $NIBX_t < 0$ than when $NIBX_t > 0$ (paired difference t-test $= 2.2$, one-tailed p-value $= 0.03$). The coefficient on net capital contributions is only reliably positive when $NIBX_t > 0$. However, controlling for v yields coefficients on both dividends and net capital contributions that are insignificantly different from zero, and insignificantly different for $NIBX_t < 0$ observations versus $NIBX_t > 0$ observations.

The first set of regressions in Panel B indicates that the violations of dividend and net capital contributions displacement reported in Panel B of Table 3 are only statistically reliable for $NIBX_t > 0$ observations. For $NIBX_t < 0$ observations, displacement cannot be rejected at the 5% level for either dividends or net capital contributions.[15] Moreover, although the partial derivative of equity market value with respect to dividends is larger when $NIBX_t < 0$ than when $NIBX_t > 0$ (3.46 versus 2.40),

15 This may be in part because in our data $NIBX_t > 0$ some 94% of the time, leading to substantially less precise year-by-year coefficient estimates for the $NIBX_t < 0$ data partition.

the difference in the two partial derivatives is not statistically significant (paired difference t-test $= 0.4$). This indicates that although the degree of the departure from dividend displacement is increasing in the credibility of the dividend signal, the relation is not statistically significant.

The second and third sets of regressions in Panel B reveal that the coefficient on dividends in an equity market value regression that includes v is not zero regardless of the credibility of the dividend signal. If v is included directly as an additional explanatory variable per equation (4), $\partial \text{MVE}/\partial \text{DIV} = -0.30$ (t-statistic relative to the null of $-1 = 1.9$, one-tailed p-value $= 0.05$). If v is addressed indirectly through incorporating one-year-ahead forecasted earnings as an additional explanatory per equation (6), $\partial \text{MVE}/\partial \text{DIV} = 0.42$ (t-statistic relative to the null of $-1 = 4.3$). These results are inconsistent with the joint hypothesis that dividends are used to signal profitability and analysts' forecasts are rational.

(c) The Analyst Misforecasting or Market Mispricing Explanations

Tables 6 and 7 report evidence that bears on the validity of the proposition that dividends are positively priced because they are correlated with—or even more severely, are sufficient statistics for—analysts' misforecasting of earnings and/or investors' mispricing of the information in current book equity and earnings.

The first regression reported in Table 6 is identical to that reported in the second portion of Table 4, Panel D. It shows that dividends (but not net capital contributions) are priced materially higher than dividend displacement even after indirectly controlling for other information v through analysts' forecasts of one-year-ahead earnings, FNIBX_{t+1}. The second regression in Table 6 demonstrates that controlling for realized one-year-ahead analyst forecast errors, denoted UNIBX_{t+1}, yields a pricing on dividends that is very close to dividend displacement. This implies that either dividends are a sufficient statistic for analysts' misforecasting of earnings, or investor mispricing of book equity or earnings (the non-dividend primitives in the model), or both. Adding weight to this inference is the third regression in Table 6 where the same

Table 6

Mean Coefficients and Associated *t*-statistics from Annual Cross Sectional OLS Regressions of the Market Value of Common Equity on Independent Variables in Ohlson's (1995 and 2001) Model and One-year-ahead Analyst Earnings Forecast Errors
(Data are US firm-year observations, 1984–1995[a])

$$MVE_{it} = c_{0t} + c_{1t}BV_{it} + c_{2t}NIBX_{it} + c_{3t}DIV_{it} + c_{4t}NETCAP_{it} + c_{5t}FNIBX_{i,t+1} + c_{6t}UNIBX_{i,\,t+1} + e_{it}$$

	Estimated Coefficients								
Data Partition	c_1	c_2	c_3	c_4	c_5	c_6	*Mean Adj.*R^2	$\partial MVE/\partial DIV$[d]	$\partial MVE/\partial NETCAP$[e]
Only DIV > 0	0.37[b]	2.88	1.67	0.66	6.25		87%	0.55	−0.45
observations	(5.5)[c]	(9.8)	(4.4)	(1.9)	(11.9)			[4.4][f]	[1.5]
Only DIV > 0	0.27	1.01	0.50	0.40	9.24	1.88	88%	−0.89	−0.98
observations	(3.8)	(2.7)	(1.5)	(1.1)	(10.9)	(5.2)		[0.3]	[0.1]
Only DIV = 0	0.88	0.31		−1.82	7.09	0.52	63%		−3.54
observations	(10.6)	(0.8)		(−5.9)	(10.0)	(1.5)			[−7.0]

Notes:

[a] Variable definitions are per Table 1. For a firm year to be included, the following variables all had to be non-missing: MVE, BVE, NIBX, DIV, NETCAP, and FNIBX. Industry dummies are included but their coefficient estimates are not reported.

[b] Mean year-by-year coefficient estimate.

[c] *t*-statistics versus a null of zero are in (.) and are based on the standard error of year-by-year coefficient estimates.

[d] When other information is included in the regression via the term v_t, dividend displacement predicts that $\partial MVE/\partial DIV = -1 = c_3 - c_1$. When other information is included in the regression via the term $FNIBX_{t+1}$, dividend displacement predicts that $\partial MVE/\partial DIV = -1 = c_3 - c_1 - (c_6 \times r)$.

[e] When other information is included in the regression via the term v_t, net capital contributions displacement predicts that $\partial MVE/\partial NETCAP = -1 = c_4 - c_1$. When other information is included in the regression via the term $FNIBX_{t+1}$, dividend displacement predicts that $\partial MVE/\partial NETCAP = -1 = c_4 - c_1 - (c_6 \times r)$.

[f] *t*-statistics versus a null of −1 are in [.] and are based on the standard error of year-by-year coefficient estimates.

Table 7

Tests of the Rationality of Analysts' One-year-ahead Earnings Forecasts
(Data are dividend paying US firm-year observations only, 1984–1995[a])

Panel A: Correlations: Pearson (Spearman) Correlations are Above (Below) the Diagonal[b]

Variable	$NIBX_{t+1}$	$FNIBX_{t+1}$	$UNIBX_{t+1}$	DIV_t	$NETCAP_t$
$NIBX_{t+1}$		0.91**	0.18**	0.79**	0.10*
$FNIBX_{t+1}$	0.86**		−0.15**	0.83**	0.11*
$UNIBX_{t+1}$	0.31**	−0.03		−0.13**	−0.04**
DIV_t	0.75**	0.85**	−0.01		0.05
$NETCAP_t$	0.04	0.03	−0.04**	0.03	

Panel B: Regressions of Actual One-year-ahead Earnings on Analysts' Forecasts and Dividends[c]

$$NIBX_{i,t+1} = \pi_{0t} + \pi_1 FNIBX_{i,t+1} + \pi_2 DIV_{it} + \pi_3 NETCAP_{it} + f_{it}$$

Estimated Coefficients			
π_1	π_2	π_3	*Mean Adj.*R^2
0.89[d]			83%
[–5.7][e]			
0.79	0.26	0.02	84%
[–6.6]	(3.8)[f]	(1.0)	

Notes:

[a] Variable definitions are per Table 1. For a firm year to be included, the following variables all had to be non-missing: MVE, BVE, NIBX, DIV, NETCAP and FNIBX.

[b] Mean year-by-year coefficient estimate. Single and double asterisks denote that the *t*-statistic on the mean correlation is reliably different from zero under a two-tailed test at the 5% and 1% levels, respectively.

[c] Industry dummies are included but their coefficient estimates are not reported.

[d] Mean year-by-year coefficient estimate.

[e] *t*-statistics versus a null of +1 are in [.] and are based on the standard error of year-by-year coefficient estimates.

[f] *t*-statistics versus a null of zero are in (.) and are based on the standard error of year-by-year coefficient estimates.

regression is estimated for non-dividend-paying firm-year observations. For non-dividend-paying firm-year observations, UNIBX_{t+1} is not reliably incrementally associated with equity values (estimated coefficient = 0.52, t-statistic = 1.5).

We attempt to discriminate between analysts' misforecasting and investor mispricing for dividend-paying firm-year observations by evaluating the role that dividends play, if any, in any deviations of analysts' earnings forecasts from rational expectations. Recall from Section 3(*iv*) that if analysts are less than fully rational, and if dividends are a sufficient statistic for analysts' misforecasting of earnings, then [1] without controlling for dividends, analysts' forecasts should not be rational; [2] dividends should help forecast future earnings after controlling for analysts' forecasts; and [3] controlling for dividends, analyst forecasts should be rational. We report the results of testing these predictions in Table 7.

The first regression in Panel B of Table 7 indicates that analyst one-year-ahead earnings forecasts are not rational expectations. The coefficient on FNIBX_{t+1} is materially less than one (t-statistic relative to a null of one = −5.7). However, the second regression in Panel B shows that although dividends help forecast future earnings after controlling for analysts' forecasts, controlling for dividends does not result in rational analyst earnings forecasts. As such, the results in Panel B do not support the proposition that dividends are positively priced because they are a proxy for analysts' misforecasting of earnings.

By default, this leaves investor mispricing as the explanation for why dividends are positively priced. That is, our results suggest that dividends are mispriced because dividends are correlated with (even sufficient statistics for) investors not fully incorporating the information in current earnings and book equity about the firm's expected future cash flows and/or risk. We have therefore exchanged one puzzle for another. We stress that the reliance that our solution to the anomalous positive pricing of dividends places on investor mispricing merits strong caution. Thousands of US firms pay dividends every quarter, making it challenging to conclude that investors could be so imperfect in the presence of so repeated a signal. As such, it would be well worth future research seeking to replicate our findings in other countries and in other time periods, and

seeking to develop and test other explanations. For example, it might be that dividends are correlated with flaws in the linear information dynamics that underpin the Ohlson model, or with omitted risk factors, or with the expected growth in long-term earnings, or tax factors. Further work might also integrate our findings with behavioral finance theories of firms' dividend policies and managers' responses to stock mispricing (e.g., Shefrin and Statman, 1984; and Baker and Wurgler, 2004).

6. SUMMARY AND CONCLUDING REMARKS

In this study, we have employed Ohlson's (1995 and 2001) accounting-based equity valuation model to structure tests of four explanations for the anomalously positive pricing of dividends reported by Rees (1997) and Fama and French (1998). Our empirical analysis is inconsistent with explanations that propose that dividends are simply a proxy for publicly available information that helps predict future abnormal earnings, or signals of management's private information. What our results do appear to be consistent with is that proposition that dividends are positively priced because they are a proxy for mispricing by investors of current earnings and/or book equity. We leave it to future research to resolve the anomaly that we have uncovered.

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