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Citation for published version:
Rees, W & Valentincic, A 2013, 'Dividend irrelevance and accounting models of value', *Journal of Business Finance and Accounting*, vol. 40, no. 5-6, pp. 646-672. https://doi.org/10.1111/jbfa.12032

Digital Object Identifier (DOI):
10.1111/jbfa.12032

Published In:
Journal of Business Finance and Accounting

JBFA Journal of Business Finance & Accounting

Journal of Business Finance & Accounting, 40(5) & (6), 646–672, June/July 2013, 0306-686X
doi: 10.1111/jbfa.12032

Dividend Irrelevance and Accounting Models of Value

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Abstract: In accounting models of value, dividends typically appear to have a strong positive relationship with value despite theoretical reasons to expect dividend displacement. We show that this result is driven by the relationship between dividends and both core earnings and other information derived from the valuation error in the prior year. Where core earnings can be effectively modelled in a specification including other information, dividend displacement is no longer rejected. Under these circumstances dividends exhibit weak incremental predictive power for earnings and earnings expectations and hence have little impact on value. We show that valuation models are sensitive to model specification and should be used with caution when testing the value impact of firm characteristics or accounting numbers.

Keywords: dividend displacement, core earnings, other information, valuation models, value relevance tests

1. INTRODUCTION

In this paper, we revisit a problem that has been puzzling researchers for some time: why do dividends appear to have a strong positive impact on value in accounting-based models (e.g. Rees, 1997; Fama and French, 1998; Giner and Rees, 1999; Akbar and Stark, 2003; and Hand and Landsman, 2005) when Miller and Modigliani's (1961) dividend irrelevance theory would have us expect dividend displacement? There are two possible, not necessarily mutually exclusive, explanations. Firstly, paying dividends may be value relevant, at least in certain circumstances. This relevance could be driven by a causal impact of dividends on value or an incremental predictive association of dividends with value. Secondly, the results in the papers referred to above may be misleading in that they overstate the impact on value of paying dividends.

*The first author is from the University of Edinburgh Business School, Edinburgh, UK. The second author is from the Faculty of Economics, University of Ljubljana, Slovenia. The authors would especially like to thank Andrew W. Stark, the Editor, and an anonymous referee for their advice that has greatly helped to improve the manuscript both in content and in exposition. The authors also wish to thank the participants at the JBFA Capital Markets Conference 2012 for helpful comments and suggestions received, Colin Clubb, Jo Danbolt and Martin Walker and participants at the EAA 2008 annual congress and workshop participants at the universities of Amsterdam, Baruch College, Exeter and Glasgow. (Paper received December, 2007; revised version accepted May, 2013).

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According to the original Miller and Modigliani (1961, hereafter M&M) hypothesis, dividend policy should not impact on value unless it implies changes in a firm's value-creating investments or operational decisions.[1] Therefore if a firm pays out one unit of currency to its shareholders, it loses value by one unit, unless there is a further impact of that transaction on operational or investment decisions. Miller and Modigliani's (1961) definition of their basic assumptions of perfect markets, rational behaviour and perfect certainty clarify some of the circumstances in which we might find a positive valuation effect of dividends. Briefly summarised, they exclude from their model dominant shareholders, information asymmetry, transaction costs, tax effects, incentives other than wealth maximisation, and uncertainty about the "*future investment programme and future profits of every corporation*" (1961, p. 412). Thus, we might look for a value impact of dividend payment where these restrictions do not apply i.e., where we have inefficient capital markets, governance issues, agency problems, information asymmetry and signalling, differential tax treatment or uncertainty. This wide list of exemptions suggests that dividend relevance could be quite common and Dhanani's (2005) survey of British financial managers suggests that they view dividends as impacting on value, although via signalling and tax clientele effects rather than through governance, agency or capital market considerations.

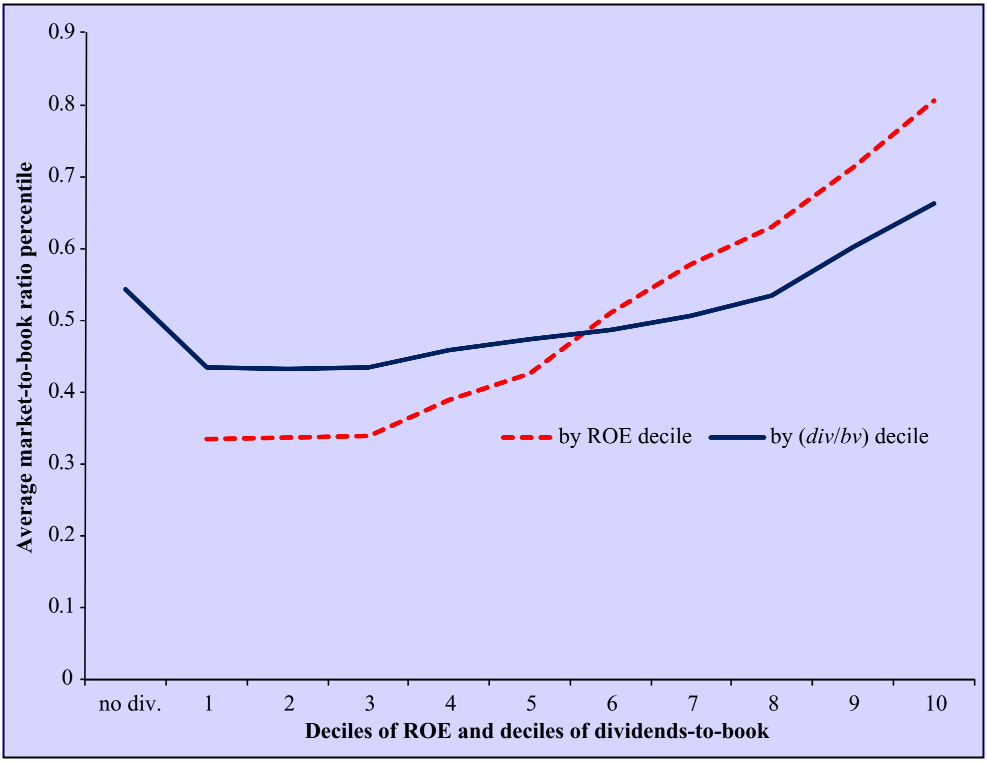
The second explanation for a positive impact of dividend payments is that existing models of value may overstate the impact, or even suggest a positive impact when none exists. We might expect this to happen under a number of different scenarios. Firstly, if we fail to effectively model expectations about future cash flows, and dividends are correlated with those expectations, dividends could appear to positively affect value when they are only acting as a proxy for expectations (Clubb, 2013). Secondly, if our underlying model is not linear but we impose linearity on the data, the significance of any of the variables, including dividends, might be misrepresented. Thirdly, both Stark (1997) and Pope and Wang (2005) point out that if components of earnings have different time-series characteristics, they should have different value relevance. Clubb (2013) similarly hypothesises that an undefined "core" earnings construct may indicate value. If dividends are correlated with components of earnings that have high value relevance, and if we do not model those components explicitly, dividends may appear to be value relevant. Fourthly, Pope and Wang (2005) and Clubb (2013) also argue that dividends will attract a more positive coefficient where accounting is conservative than where accounting is unbiased. Finally, Barth and Clinch (2009) show that if we fail to control for size effects, any size related variable, such as dividends, may attract a more positive coefficient than it would otherwise.

Our data confirm a clear association between value and both net income and dividends. Figure 1 shows the average percentile of price scaled by book value across ROE deciles and across dividend-to-book ratio deciles (plus an additional group consisting of firms that do not pay dividends). The correlations between value and both dividends and income become stronger if the non-linearities caused by zero-dividend firms and negative income firms (concentrated in deciles one to three of

1 This has recently become open to debate and DeAngelo and DeAngelo (2006), Handley (2008) and Clubb and Walker (2012) have reviewed the applicability of the original M&M hypothesis. These papers identify circumstances where M&M may not hold and, in the case of Clubb and Walker (2012), they specify some possible implications for accounting based valuation models. However, these papers imply a relaxation of the M&M restrictions.

Figure 1

Market-to-book Percentile by Return-on-equity Decile and Dividends-to-book Decile



Note:
The chart shows the average market-to-book (mv_t) percentile for each decile of return-on-equity (ni_t) and decile of dividends-to-book (d_t), plus a zero category for firms not paying dividends. The variables are calculated across the full dataset of 18,045 cases and the percentile score is not weighted but is a simple average of the 10 (or 11 in the case of dividends-to-book ratio) categories, thereby ensuring that each percentile score is comparable with the next.

ROE and plus the additional group consisting of firms that do not pay dividends) are removed from the analysis. A fundamental question for our research is whether dividends are still correlated with value when we control for income and other control variables that effectively predict profitability.

When we apply the standard approach to our sample of UK firms drawn from 1990 to 2011 we find that the strong positive coefficient on dividends found by earlier studies is repeated. However, when we focus on a model where we can reliably incorporate estimates of future profitability by a) restricting our sample to profitable dividend-paying firms, b) incorporating a measure of "other information" not included in the accounting variables, and c) segmenting the net income figure into a relatively permanent "core" and a more transient component, we find that dividends no longer appear to be value relevant. We also show that dividends are positively associated with other information and core earnings and are incrementally value relevant if these dimensions are excluded but not otherwise.

Our results cannot prove the negative – that dividends are not value relevant. Indeed we find sub-samples where marginal value relevance appears to remain. However, it is clear that the strong relationship between dividends and value is only apparent where the model does not adequately capture expected profitability. We are able to model profitability but only for a sample restricted to profitable dividend-paying firms, although these observations still represent 58.6% of our original sample. Our interpretation is that the accounting-based valuation model is unreliable when applied to the full sample, and researchers should be careful when using valuation models of this type to examine the effect of information or firm characteristics on value. We demonstrate this by estimating the value relevance of capital expenditure where the results fluctuate from strongly significant positive value relevance to insignificant as the model's ability to capture expected profitability improves.

2. PREVIOUS EVIDENCE ON DIVIDENDS AND VALUE

Accounting-based valuation models typically assume that the value of a firm is described by the residual income valuation model, founded on the assumption that a) price is given by the discounted value of expected dividends, and b) accounting is described by the clean surplus relationship (Peasnell, 1982; and Ohlson, 1995). Thus:

$$mv_t = \sum_{t=1}^{\infty} R^{-s} E_t[d_{t+s}] = bv_t + \sum_{t=1}^{\infty} R^{-s}\ E_t\left[x^a_{t+s}\right]$$

where mv_t is price, R is one plus the cost of capital, E_t denotes expectations, d_t is dividends including all capital contributions or dispersions, bv_t is the book value of equity and x_t^a abnormal earnings defined as $x_t - r{\cdot}bv_{t-1}$ where x_t is clean surplus earnings and r the cost of equity capital. In this model, paying dividends reduces the concurrent book value of equity but does not affect concurrent earnings.

As the book value of equity (bv_t) is known the valuation-modelling problem is to derive a theoretically convincing and empirically robust model of the present value of expected abnormal earnings (PVAE). Many accounting models of value claim consistency with the seminal Ohlson (1995) paper which, based on an assumed linear information dynamics, implies the following:

$$mv_t = (1-k)bv_t + k(\varphi ni_t - (d_t + oc_t)) + \alpha v_t$$

where mv_t, bv_t, ni_t, d_t, oc_t and ν_t are defined as market value, book value of equity, net income, dividends, other capital transactions and other information, respectively. In the Ohlson paper, dividends and other capital are not separated and are treated as one variable. Other information is that data, other than the defined accounting variables, containing incremental information relevant to the time series behaviour of abnormal earnings. k, φ and α are parameters which vary with the cost of capital and the autocorrelation of both abnormal earnings and other information.[2] Although influential, Ohlson (1995) is a sparse model that assumes that accounting is unbiased and that future abnormal earnings are predicted only by a) current abnormal earnings, and b) other information. The model has nevertheless been a starting point for many empirical papers. For example, Hand and Landsman (2005) estimate:

$$mv_{it} = a_0 + a_1 bv_{it} + a_2 ni_{it} + a_3 d_{it} + a_4 oc_{it} + e_{it}$$

without variables representing other information, and:

$$mv_{it} = b_0 + b_1 bv_{it} + b_2 ni_{it} + b_3 d_{it} + b_4 oc_{it} + b_5 v_{it} + b_6 fni_{it} + e_{it}$$

incorporating the portion of analysts' forecasts not predicted by an autoregressive model of earnings (ν_t), and analysts' forecast of one-year ahead earnings (fni_{t+1}) to represent two alternative formulations of other information. This approach splits Ohlson's (1995) total dividends variable into two components, dividends and other capital transactions, and incorporates two indicators of Ohlson's other information, (ν_t and fni_t), but is otherwise a direct empirical analogy of Ohlson's theoretical model of value. Other papers, such as Akbar and Stark (2003), Pope and Wang (2005)[3] and Clubb (2013), have proposed models that are not explicitly founded on Ohlson's model but that lead to similar empirical specifications, although with some substantive differences. These differences include variation in the way other information is modelled, if at all; choices regarding the inclusion or not of other capital changes and whether to split this into repurchases and new share issues; variation in the specification of earnings, particularly whether to identify research and development expenditure separately or not; and whether to identify core earnings separately from comprehensive earnings. The implications of these alternative approaches are discussed in section 3.

Despite the differences in models, estimation techniques and test statistics, the evidence from earlier studies is broadly consistent. Using a pooled cross-section and time-series for 1987–1995 for UK firms, and without variables to model other information, Rees (1997) estimates significant coefficients on dividends in the range 10–13 (after adjusting for the impact of the dividend payment on the book value of equity). Despite increasing sophistication in model specification, similar results are found by Fama and French (1998), Hand and Landsman (2005), Pinkowitz et al. (2006) and Dittmar et al. (2007) for US firms, Giner and Rees (1999) for Spanish firms and Akbar and Stark (2003), Poletti Hughes (2008), Dedman et al. (2009), Gregoriou (2010) and Dedman et al. (2012) for British firms. In all cases the core results reveal coefficients on dividends that are significant and positive and inconsistent with dividend displacement. In addition, the evidence shows that where research and development expenditure is separated from other income it is

2 φ is $R/(R-1)$, k is $(R-1)\cdot\omega/(R-\omega)$ and α is $R/(R-\omega)\cdot(R-\gamma)$ and R is 1 plus the cost of capital, ω the autocorrelation coefficient on abnormal earnings and γ the autocorrelation coefficient on other information.

3 Pope and Wang (2005) initially specify a model without reliance on Ohlson (1995) but then develop an analysis of the expected coefficients based on a particular case of Ohlson's (1995) linear information dynamics.

typically robustly positive and significant (Green et al., 1996; Akbar and Stark, 2003; Dedman et al., 2012; and Shah et al., 2009), although some papers report weaker results (Franzen and Radhakrisnan, 2009); where dividends are separated from other (net) capital contributions the dividend coefficient increases and the other capital contributions coefficient falls but may remain significantly positive (Lo and Lys, 2000; Akbar and Stark, 2003; Shah et al., 2009; Oswald, 2008; Dedman et al., 2012; and Hand and Landsman, 2005); where only loss-making firms are considered, dividends are positively priced if the coefficient on book value is allowed to vary between high and low R&D intensity firms and between dividend-paying and non-dividend-paying firms (Jiang and Stark, 2013); and where measures representing other information are introduced, albeit computed in various ways, they tend to be statistically significant and can impact on the estimates of other variables' coefficients (Akbar and Stark, 2003; Hand and Landsman, 2005; and Dedman et al., 2009). Other less frequent findings include evidence that advertising expenditure (Shah et al., 2009), capital expenditure (Rees, 1997; Dedman et al., 2009; and Dedman et al., 2012), international diversification (Garrod and Rees, 1998) and leverage, measured as either debt (Rees, 1997) or interest payments (Fama and French, 1998), can significantly impact on value.

However, Lo and Lys (2000) present evidence that suggests the results referred to above may have been driven by the choice of scaling variable. For example, Rees (1997) deflates the model by number of shares in issue, Fama and French (1998) by the book value of total assets and Hand and Landsman (2005) use firm level, i.e., unscaled, variables. The Lo and Lys (2000) results suggest that the coefficients on dividends and on other capital contributions are sensitive to choices about scaling. Where the model is scaled by opening market value (or if a size-related control variable is included), coefficients on dividends and other capital contributions are negative, whereas both are positive if the model is estimated at the firm level (as in Hand and Landsman, 2005) and the coefficients on dividends are positive when using the number of shares as the deflator (as in Rees, 1997). The Lo and Lys (2000) results are consistent with Goncharov and Veenman's (2013) more recent evidence from the US. However, Akbar and Stark (2003) and Dedman et al. (2009) revisit the problem using British data and find that coefficients on dividends are reliably positive whether the model is estimated on data deflated by opening or closing book value, sales or number of shares. They also find that coefficients on other capital contributions are reliably negative. For a sample of unprofitable British firms, Jiang and Stark (2013) also report similar results using opening total assets or current book value as deflators. Akbar and Stark (2003) conclude that "*deflators have no impact on results relating to the relationship between dividends and market value in the UK*" (2003, p. 1224). Rees (2005) also reviews the impact of deflators when discussing Hand and Landsman's (2005) work. He concludes that their approach, which uses undeflated values, produces robust results, but results that are dominated by large firms and insensitive to the many small firms that may provide insight into different determinants of dividend valuation. More recently Barth and Clinch (2009) have demonstrated that valuation models can be sensitive to the choice of deflator but both number of shares (despite the lack of any theoretical justification) and closing book value of equity tend to provide reliable results. Shen and Stark (2011, p. 3) comment that current book value is "*the strongest overall performer*" as the deflator when using UK data and out-of-sample valuation errors as the choice criterion.

Hand and Landsman's (2005) results cast further light on the role of dividends in valuation. They show that dividends are positively valued unless the model incorporates analysts' forecasts and forecast error. They suggest that their results are evidence of mispricing. Their results might also be interpreted as confirming that dividends provide information on future earnings that is not available in a model that simply incorporates earnings and book value of equity variables. Dividends remain influential when earnings forecasts are incorporated, possibly because the forecasts are flawed and dividends provide information concerning the forecast error. These results do not rule out the possibility that dividends provide evidence on other valuation-relevant variables, such as earnings beyond $t+1$.

The research evidence to date clearly shows that accounting valuation models typically find a highly significant and strong positive relationship between dividends and value. This could be explained by: a) a causal relationship between dividends and value; b) dividends having incremental association with future abnormal earnings; c) an assumption that the market is inefficient with respect to dividends; or d) model misspecification.

3. RESEARCH METHOD

(i) Modelling Market Value

Dividend value relevance may be driven by a causal impact of dividends on value or a predictive association where dividends do not cause a change in value but help to model it. If our models are consistent with $\partial mv_t/\partial d_t = -1$, then dividends do not have value relevance, given the competing information set. Under these circumstances dividends tell us nothing about value that is not reflected in other information variables in the model. Dividends may still impact on value if the value change caused by dividend payment has been captured by the competing information set. However, if $\partial mv_t/\partial d_t = -1$, and the information included in the model is restricted to information available before dividends became known, then dividends exhibit both predictive and causal irrelevance. In our models of value we initially restrict the variables used to accounting information from year *t*, which, save for the book value of equity, is independent of dividends at time *t*. Our tests of the statistical significance of dividends allow for the impact of dividends on equity. In subsequent developments we will include estimates of core net income and other information where both are known at time *t*, although our estimates use all available data including that from subsequent years to produce the most reliable estimates. To ensure that the use of data from periods following *t* does not introduce a bias into the our results we also test the impact of estimating core net income and other information using only data available at or before time *t*.

Following Stark (1997), Akbar and Stark (2003) and Pope and Wang (2005), we use a straightforward valuation model where market value (mv_t) is initially assumed to be a function of a vector of value relevant accounting variables ($\mathbf{z}_t$). The accounting variables are assumed to be known at the same time that dividends (d_t) are known and dividends do not affect any other explanatory variables except for the direct effect on equity of dividend transactions. Assuming that $\mathbf{z}_t$ includes book value of equity at *t*, then the accounting variables will be value relevant if they predict the present value of abnormal earnings, which implies they forecast abnormal earnings or the discount rate. Akbar and Stark (2003) specify the information set z_t as book value (bv_t), net income (ni_t), research and development expenditure (rd_t), dividends (d_t) and other capital contributions (oc_t), all measured at time t.[4] Then market value may be estimated as:

$$mv_{it} = \alpha_0 + \alpha_1 bv_{it} + \alpha_2 ni_{it} + \alpha_3 rd_{it} + \alpha_4 d_{it} + \alpha_5 oc_{it} + e_{it} \tag{1}$$

The variables are deflated by book value of equity at t and thus the α_0 coefficient is estimated on $1/bv_t$ and α_1, the book value coefficient, is based on the constant. The Akbar and Stark (2003) model makes no predictions regarding the value of coefficients in equation (1) but displacement for dividends, and other capital contributions, implies $-\alpha_1 + \alpha_4 = -1$, $-\alpha_1 + \alpha_5 = -1$, and therefore $\alpha_4 - \alpha_5 = 0$, after allowing for the concurrent change in the book value of equity.[5]

The third constraint above is not a direct test of displacement but previous studies have generated more reliable estimates of the value impact of non-dividend capital contributions than for dividends. We therefore use this relatively robust estimate of the impact of capital changes as a benchmark for the dividend impact. Dedman et al. (2010) show that the impact of dividends can be very different from that of other capital changes, but that capital contributions, special dividends and share repurchases, which collectively make up our other capital measure, all have a similar impact on value.

Thus our first model uses the specific set of value drivers identified by Akbar and Stark (2003) where "*currently observable information will be relevant in valuation if it is relevant in forecasting future abnormal earnings*" (Pope and Wang, 2009, p. 389), even though, in an empirical setting, value relevance could also come from forecasting discount rates. Dividends will exhibit displacement if the net effect on value of the book value and dividend coefficient is −1, but for equation (1) dividend displacement is not necessarily expected. Prior evidence suggests it is unlikely and we view model 1 as lacking effective indicators of future profitability. We next incorporate other information variables based on firm valuation at $t-1$ (Akbar and Stark, 2003) and core earnings at time t (Pope and Wang, 2009; and Clubb, 2013) to improve the model's capture of information regarding future earnings.

Hand and Landsman (2005) develop an estimate of other information based on Ohlson (2001) that is designed to capture information from analysts' forecasts about future abnormal income not contained in the time-series of abnormal earnings. Conversely, Akbar and Stark (2003) incorporate a measure of other information that can be seen as reflecting all value-relevant other information. They estimate the valuation error at time $t-1$ using equation (1). Whilst this is theoretically convincing

4 As we partition earnings into various segments it is convenient to maintain one definition of earnings as earnings after interest and tax. Thus in our model the impact on value of R&D expenditure is a_1 plus a_3 rather than a_3 as in Akbar and Stark (2003). We also segment net income into transient and core income and include the variable (cni_t) to identify our estimate of core income. The value impact of core income would be a_1 plus a_2 in equation (1).

5 The indirect test of value relevance is required because the payment of dividends, or other capital changes, has a concurrent impact on the book value of equity. The value impact is therefore the sum of the dividend (or other capital) coefficient less the book value coefficient and, if dividend displacement is to hold, should equal minus one.

it has some practical difficulties.[6] Firstly, as the measure of other information is a function of lagged variables from our valuation model, the coefficients in our test equation may be affected by our choice of the exact specification of the lagged model. Secondly, our analysis shows that the conventional valuation model given in equation (1) is sensitive to decisions concerning the sample. Consequently, it is not obvious what would be the correct sample or how we should estimate other information when our results would suggest that the model is unstable. Finally, the computation of other information using a lagged version of model 1 tends to generate outliers. We therefore use a version of Rhodes-Kropf et al.'s (2005) model of pricing deviations including industry and year variation. This produces an other information proxy (*oi*), which is derived independently from the income statement variables in the valuation model, can be modelled using all firms with a positive book value of equity, and produces a metric which is close to normally distributed.

Using the simplest version of the Rhodes-Kropf et al. (2005) model, the other information variable is the standardised residual from $\log(mv_{it-1}) = \delta_0 + \delta_1 \log(bv_{it-1}) + industry \cdot \delta_i + year \cdot \delta_y + e_{it-1}$ where *industry* and *year* are dummy variables representing FT industry codes and annual dummies. We chose to use standardised residuals to reduce the weight attached to risky estimates but for our dataset the results are almost identical whether we use the residual or standardised residual. The results presented are based on estimates from the pooled dataset. We are concerned to produce the best estimate of *oi* at time *t* and use industry and year specific dummies to model variation in the market-to-book relationship and this includes information derived from time periods following *t*. We find that results using annual estimates of *oi* based only on data from $t - 1$ are consistent with the results presented. With the inclusion of our estimate of other information the valuation model then becomes:

$$mv_{it} = \alpha_0^* + \alpha_1^* bv_{it} + \alpha_2^* ni_{it} + \alpha_3^* rd_{it} + \alpha_4^* d_{it} + \alpha_5^* oc_{it} + \alpha_6^* oi_{it} + e_i \quad (2)$$

We then define core net income (*cni*) as the earnings that would be expected for the firm *i* in year *t*, in the absence of information concerning idiosyncratic circumstances that might impact on the market as a whole or the firm in particular. We view core net income as a segmentation of earnings into core and transitory components consistent with Stark's (1997) equation (3a) or Pope and Wang's (2005) equation (4). We estimate this as $cni_{it} = \phi_0 + \phi_1 fy0_{it} + \phi_2 fni_{it-1}$ where $fy0_{it}$ is the actual earnings figure at time *t* as available through the I/B/E/S system at time *t* (after adjusting for discontinued operations, extraordinary charges and other non−operating items and made available immediately after the earnings figure is published) and fni_{t-1} is the expectation (analysts' mean forecast) at time $t - 1$ of net income at *t*. Thus the slope coefficients are estimated from a regression of this year's net income (ni_{it}) on both the prior forecast of this year's net income (fni_{it-1}) and this year's base earnings ($fy0_{it}$). As for other information we estimate core net income using all available information from the pooled sample including data from periods after $t = 1$. The results are consistent with those presented if we run annual regressions at $t - 1$ or restrict the model to either $fy0_t$ or fni_{t-1}.

6 If we use the Akbar and Stark (2003) approach to estimating *oi*, and after making reasonable assumptions about model specification and outlier deletion, we are able to generate results that are consistent with the results presented. However, the results based on the Rhodes-Kropf et al. (2005) approach are more robust and simpler, both theoretically and empirically.

We estimate equation (3) with and without core income as the impact of the introduction of this variable is instructive:

$$mv_{it} = \alpha_0^{**} + \alpha_1^{**} bv_{it} + \alpha_2^{**} ni_{it} + \alpha_3^{**} rd_{it} + \alpha_4^{**} d_{it} + \alpha_5^{**} oc_{it} + \alpha_6^{**} oi_{it} + \alpha_7^{**} cni_{it} + e_{it} \quad (3)$$

Equation (3) supplements the basic model 1 with two types of other information. Both are expected to exhibit value relevance if they have incremental predictive ability for abnormal earnings (or for discount rates). This is not an exhaustive model and line items that identify different time-series behaviour of components of earnings, or identify different value relevance under-different circumstances, may have incremental value relevance (see, for example, Jiang and Stark, 2013). However, the model incorporates the standard variables included in recent research and is consistent with recent theoretical papers (such as Pope and Wang, 2005; Clubb and Walker, 2012; and Clubb, 2013).

(ii) Empirical Models and Theoretical Expectations

The theoretical models of accounting and value are necessarily sparse and may not necessarily describe empirical relationships. However a review of the linear information dynamics models may provide useful insights into the interactions between the variables used in the models above. Equation 1 above is consistent with Ohlson (1995) if we assume: i) that the accounting variables are sufficient to effectively model market value and hence there is no role for "other information"; ii) that partitioning total capital contributions into dividends and other capital contributions has no theoretical impact; and iii) partitioning net income into research and development, transitory and core net income also has no theoretical impact. However, in Ohlson's (1995) analysis, expected abnormal earnings is a function only of current abnormal earnings and other information which contains only information independent of abnormal earnings. Clubb's (2013) analysis supplements Ohlson's (1995) model by initially allowing a role for dividends in predicting future abnormal earnings. His model of value, here adapted to incorporate total earnings rather than abnormal earnings, is:

$$mv_t = (1 + \beta - \gamma r) \cdot bv_t + (\beta - \gamma r) \cdot \mathrm{d}_t + (\gamma + \gamma r) \cdot ni$$

where $\beta = \omega_d/(R - (\omega_{d+}\,\omega_{ae}))$, $\gamma = \omega_{ae}/\,(R - (\omega_d + \omega_{ae}))$, ω_d and ω_{ae} are the coefficients on dividends and abnormal earnings, respectively, when predicting abnormal earnings at $t + 1$, $R = 1 + r$ and r is the cost of capital. It is interesting that Clubb (2013) concludes that dividends may attract a positive coefficient in equation (1) but still exhibit dividend displacement. As in Pope and Wang (2005), the coefficient on dividends is positively associated with accounting conservatism, although in Pope and Wang's (2005) model this would not be consistent with dividend displacement.

Clubb (2013) also proposes a role for an "undefined" variable that can either be thought of as a prediction of abnormal earnings or a basis from which to make that prediction which he views as "recurring abnormal earnings". We treat both core net income and our other information variable as indicators of recurring abnormal earnings. Core net income is an explicit attempt to model the expected earnings in time t and is consistent with Pope and Wang's (2005) core net income. Our other information variable captures the mis−valuation based on accounting values at time t that is, by definition, a function of expected abnormal earnings. The introduction of better indicators of income into the model implies a reduction in the coefficient on dividends and book value.

(iii) Impact of Dividends and Other Capital Changes on Core Earnings and Other Information

We use two indicators of expected abnormal earnings in equation (3): a) core net income for year t, and b) other information. In equations (4) and (5) we identify the link between our estimate of a) core earnings, and b) other information with the other components in the valuation model. This estimation process is in part redundant as the coefficients can be calculated from the impact of introducing either core earnings or other information into the valuation models. However, estimating the relationship directly is convenient and identifies the statistical significance of the coefficients. Hence, we estimate:

$$cni_{it} = \beta_0 + \beta_1 bv_{it} + \beta_2 ni_{it} + \beta_3 rd_{it} + \beta_4 d_{it} + \beta_5 oc_{it} + \beta_6 oi_{it} + e_{it} \tag{4}$$

In equation (5) we replace the dependent variable core net income with the other information variable (oi_t):

$$oi_{it} = \beta_0^* + \beta_1^* bv_{it} + \beta_2^* ni_{it} + \beta_3^* rd_{it} + \beta_4^* d_{it} + \beta_5^* oc_{it} + \beta_7^* cni_{it} + e_{it} \tag{5}$$

Here we are concerned to test whether there is a relationship between the level of dividends or other capital contributions and either core net income and other information. As both dividends and capital contributions also directly impact on equity we allow for the direct impact via the dividends coefficient and the indirect impact via the book value of equity coefficient. Thus, for both equation (4) and (5), insignificance relationships between both dividend and other capital contribution and both core net income and other information implies $-\beta_1 + \beta_4 = 0$, $-\beta_1 + \beta_5 = 0$ and hence $\beta_4 - \beta_5 = 0$.

(iv) Modelling Earnings Expectations

In equations (6) and (7) we examine the predictive ability of our accounting measures of value for earnings expectations. We have two available measures of earnings expectations: actual earnings in period $t + 1$ (ni_{t+1}) and forecasts in period t of earnings in $t + 1$ (fni_{t+1}). Neither measure captures long run expectations of earnings; the former measures earnings expectations plus unexpected earnings and the latter is contaminated by well-established biases in analysts' forecasts (Ramnath et al., 2008). Whilst we expect analysts' forecasts to be a better measure of long-run profitability, we treat the outcome as an empirical issue and examine the role of accounting variables in predicting the two measures of earnings expectations. It is not clear why any of the independent variables examined in equations (1), (2) and (3) would have value relevance if they did not have predictive value for expected earnings. Neither of our dependent variables in equations (6) and (7) below fully captures the value of

Table 1

Sample Formation Procedure

Initial cases with mv_t, bv_t, ni_t, rd_t, d_t, oc_t available	29,303
Less cases with negative book value of equity	1,742
	27,561
Non-missing variables for the basic model less accounting year longer than/shorter than 1 year plus/minus 3 months	369
=Total number of cases before outlier deletion	27,192
less outliers on all variables simultaneously	1,292
Total number of observations in sample	25,900
with other information estimates available	21,896
with core income estimates available	13,262
Profitable, dividend-paying observations	15,185
with other information estimates available	13,491
with core income estimates available	10,005

Note:
The variables are defined as follows: mv_t is market value of equity six months after the year end, d_t is ordinary dividends, ni_t is net income, oc_t is other capital changes such as stock issues or repurchases, rd_t is research and development expenditure and all variables are deflated by the closing book value of equity. The initial sample is drawn from all firms available on the Datastream database for the UK, active and dead firms, for the years 1990–2011.

expected earnings but it is difficult to see why there would not be a strong relationship across a broad sample between year $t + 1$ earnings and the value of future abnormal earnings:

$$ni_{it+1} = \gamma_0 + \gamma_1 bv_{it} + \gamma_2 ni_{it} + \gamma_3 rd_{it} + \gamma_4 d_{it} + \gamma_5 oc_{it} + \gamma_6 oi_{it} + \gamma_7 cni_{it} + e_{it} \tag{6}$$

$$fni_{it+1} = \gamma_0^* + \gamma_1^* bv_{it} + \gamma_2^* ni_{it} + \gamma_3^* rd_{it} + \gamma_4^* d_{it} + \gamma_5^* oc_{it} + \gamma_6^* oi_{it} + \gamma_7^* cni_{it} + e_{it}. \tag{7}$$

The expectation is that the slope coefficient on dividends will be positive and significant in a model of $t + 1$ earnings, whether measured as actual or expectations (equations (6) and (7), where: a) the model includes firms with losses, as net income will prove to be a poor indicator of subsequent net income; or b) where core net income or other information are excluded, as both variables are expected to be associated with subsequent net income. For equations (6) and (7) if dividend and other capital contributions have no impact on expected earnings this implies $-\gamma_1 + \gamma_4 = 0$, $-\gamma_1 + \gamma_5 = 0$ and hence $\gamma_4 - \gamma_5 = 0$.[7]

(v) Data

The sample derivation is reported in Table 1. The full sample contains 25,900 cases drawn from UK industrial and commercial quoted companies during the period 1990 to 2011 (after deletion of 4,037 cases with missing values, 369 with accounting periods

7 There is good reason to expect that capital changes will have an impact on subsequent earnings, and hence forecasts of earnings, equal to the change in capital times the cost of equity. However, we are concerned here with determining whether dividends or other capital contributions have a significant impact on expected earnings. It is also the case that the net coefficient suggested by the cost of capital is sufficiently small that we are unlikely to be able to determine a statistically significant difference from zero.

not falling within 9 to 15 months,[8] 1,742 cases with negative book value of equity and 1,292 cases with outliers). Outliers are defined as the extreme top and bottom 1% of each variable except where the variable is truncated at zero. The sample is restricted to 21,896 cases where we require estimates of other information (*oi*) and to 13,262 where we additionally require estimates of core net income (*cni*). For some tests we restrict our sample to cases with positive net income and positive dividends, which limits the original sample to 15,185, the other information sample to 13,491, and where core net income is additionally required to 10,005.

The data are collected from Thomson Financial Datastream and the accounting numbers originate from Worldscope whereas the forecast numbers are from I/B/E/S. ni_t is net income available to common (Worldscope code WC01751), rd_t is research and development expenditure (WC01201), d_t is ordinary dividends[9] (WC05376) and oc_t is other capital changes such as issues (WC04251) or repurchases (WC04751). For accounting periods ending before the 20th January 2007, UK firms had up to six months after the financial year-end to publish accounting data and this was reduced to four months for accounting periods ending after that date following the implementation of the Transparency Directive 2004/109/EC. To maintain consistency we collect the market value of equity (mv_t) six months after the financial year-end. We deflate all variables by current book value of equity (WC03501).

As we have curtailed the sample for some of our tests, we present statistics to demonstrate that our final samples are similar to the full sample in their important characteristics. The descriptive characteristics of the full and profitable dividend-paying sample are broadly similar although of course the means of dividends and net income are higher.

In Table 2 we report both Pearson product moment and Spearman rank correlations between the variables of interest. Relatively high positive Pearson correlations are observed between market value (mv_t) and the deflated intercept ($1/bv_t$), dividends (d_t) and other information (oi_t) for the full sample. When rank correlations are used, strong correlations are reported for dividends (d_t), other capital changes, (oc_t) net income (ni_t), and other information (oi_t). For the sample restricted to positive dividend payers, the correlations are higher for dividends, net income and other information. This might be expected given the non-linearities between value and both dividends and profits demonstrated in Figure 1.

In the second panel of Table 2, we see very similar descriptive statistics for the I/B/E/S sample as for the full sample. The same pattern is also repeated across the correlation matrices in panels 1 and 2. The new core net income variable (cni_t) is strongly correlated with the market value for both samples and for both correlation methods. The only important difference between the panel 1 and panel 2 descriptive statistics is that net income has a relatively high product moment correlation with

8 A more restrictive rule on the length of the accounting year makes little difference to the sample or the results. A plus or minus 15 day cut would reduce the sample by only 1.8%. Moreover, it is not uncommon to observe accounting year-end switches within this interval, with some firms switching in considerably longer or shorter periods (Garrod and Valentincic, 2005).

9 IFRS became mandatory for all listed companies in the EU for accounting periods beginning on or after 1st January 2005. This changed the way firms account for dividends paid. Under SSAP 17, dividends were accounted for on an accrual basis. Under IFRS, recognising dividends declared after the end of reporting period is prohibited (IAS 10 – Events after the reporting period). Instead, such dividends are accounted for in the period in which they are paid. Our results are not sensitive to this change.

Table 2
Descriptive Statistics

	mv_t	$1/bv_t$	d_t	oc_t	ni_t	rd_t	oi_t
Panel 1: Full Sample							
Full Sample							
Mean	2.805	0.169	0.046	-0.124	−0.016	0.028	−0.098
Sd	3.798	0.569	0.061	0.316	0.485	0.083	0.934
min	0.139	0.000	0.000	−2.464	−5.715	−0.047	−4.711
max	50.717	23.810	0.557	0.240	1.147	0.708	2.843
Profitable Dividend-paying Sample							
Mean	2.743	0.068	0.069	−0.049	0.170	0.019	0.088
Sd	3.265	0.141	0.062	0.184	0.135	0.055	0.746
min	0.139	0.000	0.000	−2.442	0.000	0.000	−3.851
max	50.717	4.202	0.557	0.240	1.147	0.708	2.827
Full Sample – Correlation Matrix							
mv_t	1.000	0.088	0.222	−0.235	0.371	0.144	0.682
$1/bv_t$	0.254	1.000	−0.352	−0.021	−0.258	−0.119	−0.127
d_t	0.206	−0.108	1.000	0.144	0.575	0.051	0.321
oc_t	−0.178	−0.156	0.185	1.000	0.082	−0.084	−0.237
ni_t	0.003	−0.323	0.273	0.248	1.000	0.013	0.441
rd_t	0.175	0.027	−0.017	−0.100	−0.134	1.000	0.091
oi_t	0.488	0.000	0.337	−0.099	0.310	0.066	1.000
Profitable Dividend–paying Sample – Correlation Matrix							
mv_t	1.000	0.048	0.497	−0.239	0.660	0.145	0.731
$1/bv_t$	0.173	1.000	−0.016	0.096	0.067	−0.178	−0.111
d_t	0.436	0.112	1.000	−0.058	0.556	0.152	0.460
oc_t	−0.133	−0.052	0.021	1.000	−0.132	−0.080	−0.233
ni_t	0.609	0.179	0.618	−0.086	1.000	0.100	0.568
rd_t	0.192	−0.005	0.143	−0.015	0.153	1.000	0.107
oi_t	0.579	−0.049	0.441	−0.084	0.532	0.121	1.000

Panel 2: I/B/E/S Sample								
I/B/E/S Sample								
Mean	2.555	0.046	0.060	−0.046	0.097	0.029	0.097	0.055
Sd	2.632	0.085	0.061	0.153	0.212	0.076	0.109	0.813
min	0.189	0.000	0.000	−1.497	−1.835	0.000	−0.613	−4.681
max	33.702	2.445	0.622	0.287	1.198	0.708	0.600	2.810
Profitable Dividend–paying I/B/E/S Sample								
Mean	2.654	0.036	0.071	−0.033	0.167	0.020	0.167	0.170
Sd	2.532	0.061	0.059	0.131	0.115	0.054	0.096	0.710
min	0.193	0.000	0.000	−1.497	0.000	0.000	−0.450	−3.702
max	33.702	0.957	0.622	0.287	1.198	0.708	0.756	2.809
I/B/E/S Sample – Correlation Matrix								
mv_t	1.000	0.077	0.374	−0.228	0.531	0.153	0.558	0.705
$1/bv_t$	0.123	1.000	−0.116	0.017	−0.045	−0.075	0.017	−0.061
d_t	0.331	−0.039	1.000	0.033	0.512	0.044	0.530	0.378
oc_t	−0.096	−0.047	0.153	1.000	−0.040	−0.086	−0.102	−0.215
ni_t	0.281	−0.114	0.358	0.125	1.000	0.001	0.682	0.513
rd_t	0.198	0.094	−0.017	−0.048	−0.162	1.000	0.039	0.080
cni_t	0.379	0.022	0.474	0.080	0.536	−0.090	1.000	0.596
oi_t	0.548	−0.019	0.377	−0.075	0.417	0.067	0.456	1.000
Profitable Dividend–paying I/B/E/S Sample – Correlation Matrix								
mv_t	1.000	0.110	0.488	−0.230	0.649	0.145	0.713	0.720
$1/bv_t$	0.105	1.000	0.038	0.021	0.106	−0.141	0.047	−0.027
d_t	0.436	0.098	1.000	−0.030	0.541	0.155	0.567	0.451
oc_t	−0.074	−0.026	0.096	1.000	−0.103	−0.072	−0.137	−0.206
ni_t	0.629	0.149	0.594	0.018	1.000	0.094	0.830	0.572
rd_t	0.206	0.027	0.141	0.018	0.128	1.000	0.127	0.096
cni_t	0.651	0.100	0.586	−0.014	0.826	0.174	1.000	0.641
oi_t	0.598	−0.018	0.428	−0.068	0.545	0.116	0.595	1.000

Note:
mv_t is the market value of common shares six months after the accounting year end, $1/bv_t$ is one divided by the book value of equity (the book value of equity is expressed in millions of pounds throughout the paper), ni_t is net income, rd_t is research and development, d_t is ordinary dividends, oc_t is other capital changes such as issues or repurchases, oi_t is our estimate of other information, and cni_t is our estimate of core net income. All variables are deflated by current book value of equity at t. The product moment correlations are below the diagonal and rank correlations are above the diagonal.

market value when loss making firms are included for the I/B/E/S sample ($\rho = 0.281$) but the statistic is negligible for the full sample ($\rho = 0.003$). This does lead to a higher slope coefficient on net income in our initial valuation models but has no discernable impact on the test variable coefficients.

4. RESULTS

(i) Tests of Displacement for Dividends and Other Capital Changes

In Table 3 we report tests of the impact of: a) restricting the sample to the I/B/E/S dataset which we use in all subsequent tables; b) excluding loss-making and zero-dividend firms; and c) introducing other information. For each regression we test whether the coefficient on dividends less that on book value is significantly different from −1, whether the coefficient on other capital changes less that on book value is significantly different from −1, and whether the coefficient on dividends is significantly different from that on other capital changes. For all four models the results for the full and I/B/E/S samples are broadly similar although there is a higher percentage of profitable dividend paying firms (79%) in the I/B/E/S sample than in the full sample (67%). The coefficient on net income is consequently lower for the full sample than for the I/B/E/S sample when loss-making firms are included. Throughout Table 3 the estimated coefficients on the control variables are consistent with prior research.

Where the models include firms with negative earnings (models 1, 3, 5 and 7) the coefficients on book value and dividends are positive and significant whilst the coefficients on other capital are negative and significant. We designate model 1, which includes the full sample and has neither other information nor core net income included as explanatory variables, as the base model. In all instances, dividend displacement is rejected, other capital displacement is rejected and equality of the slope coefficients on dividends and other capital is rejected. The inclusion of other information in models 5 and 7 results in significant positive slope coefficients on that variable; the rejection of dividend and other capital displacement is maintained as is the rejection of equality of coefficients on dividends and other capital changes.

Where loss-making firms are excluded (models 2, 4, 6 and 8) the coefficients on book value are insignificantly different from zero when other information is excluded from the model and positive and significant when other information is included. The dividend coefficients are significant and positive when other information is excluded and insignificantly positive when it is included. The coefficients on other capital changes remain significantly negative in all cases. Although the coefficient on dividends has been much reduced by excluding loss-making cases and firms not paying dividends we reject dividend displacement for models 2, 4 and 8, but not 6. Other capital displacement is not rejected for model 2 but is in the other three cases. Equality of coefficients on dividends and other capital changes is rejected in all cases.

In two instances the full and I/B/E/S samples give different results. We reject other capital changes displacement for model 4 ($-1.836 - 0.117 = -1.953$, $p < 0.05$) but not for model 2 ($-1.521 + 0.008 = -1.513$, insignificant) and we reject dividend displacement for model 8 ($1.549 - 0.706 = 0.843$, $p > 0.05$) but not for model 6

Table 3
Valuation Models Excluding Core Earnings

Model	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*
Sample	*All*	*All* ni_t & $d_t > 0$	*I/B/E/S*	*I/B/E/S* ni_t & $d_t > 0$	*All*	*All* ni_t & $d_t > 0$	*I/B/E/S*	*I/B/E/S* ni_t & $d_t > 0$
$1/bv_t$	1.848***	1.516**	3.971***	0.465	0.994***	1.355***	3.180***	1.428**
	(6.74)	(3.08)	(6.36)	(0.95)	(4.70)	(3.79)	(8.44)	(2.71)
bv_t	1.306***	−0.00850	1.050***	0.117	1.841***	0.796***	1.625***	0.706***
	(14.96)	(0.08)	(11.86)	(1.40)	(16.04)	(6.78)	(15.16)	(8.07)
ni_t	0.735***	12.41***	2.938***	11.91***	−0.147	8.349***	0.997***	8.562***
	(5.32)	(14.05)	(8.71)	(15.10)	(1.10)	(11.43)	(3.74)	(13.28)
rd_t	7.593***	5.776***	8.024***	5.658***	6.020***	5.810***	5.990***	5.413***
	(7.99)	(3.97)	(7.62)	(3.89)	(7.12)	(4.41)	(6.60)	(4.22)
d_t	15.46***	5.161***	12.94***	4.864***	7.893***	1.184	6.841***	1.549
	(13.61)	(6.00)	(13.67)	(4.36)	(8.41)	(1.16)	(8.32)	(1.78)
oc_t	−2.255***	−1.521***	−2.482***	−1.836***	−1.264***	−1.232***	−1.319***	−1.272***
	(12.15)	(4.16)	(8.81)	(4.55)	(6.00)	(4.13)	(5.15)	(4.23)
oi_t					1.344***	1.358***	1.403***	1.259***
					(10.82)	(9.18)	(11.74)	(10.33)
N	25,900	15,185	17,250	12,100	21,896	13,491	15,388	10,956
adj. R^2	0.184	0.398	0.257	0.459	0.310	0.465	0.366	0.508
F-stats.:								
$a_4 - a_1 = -1$	171.04***	48.65***	169.06***	26.89***	49.17***	1.66	49.18***	4.31*
$a_5 - a_1 = -1$	155.32***	2.52	84.11***	6.26*	93.10***	13.09***	61.12***	10.24**
$a_4 = a_5$	219.25***	45.40***	199.31***	29.18***	77.84***	4.73*	74.38***	9.40**

Notes:
The variables are defined as follows: mv_t is the market value of common shares six months after the accounting year end, $1/bv_t$ is one divided by the book value of equity, ni_t is net income, rd_t is research and development, d_t is ordinary dividends, oc_t is other capital changes such as issues or repurchases, and oi_t is our estimate of other information. All variables are deflated by current book value of equity at t. The estimated model is:

$$mv_{it} = \alpha_0 + \alpha_1 bv_{it} + \alpha_2 ni_{it} + \alpha_3 rd_{it} + \alpha_4 d_{it} + \alpha_5 oc_{it} + \alpha_6 oi_{it} + e_{it}.$$

All regressions are pooled and standard errors are 2-way clustered by year and by firm (Petersen, 2009). Absolute values of the t-statistics are given in parentheses. Coefficients or F-statistics that are statistically significant are identified by * = $p < 0.05$, ** = $p < 0.01$, *** = $p < 0.001$.

(1.184 − 0.796 = 0.308, insignificant). However, in both cases the differences between the estimated impacts are statistically insignificant. Our interpretation is that the full and I/B/E/S samples produce broadly similar results, which are close to the statistically significant cut-off.

Thus, our initial results confirm that a model including loss-making firms and excluding other information will generate results that are strongly inconsistent with dividend displacement. Improving the information set in the models, by either excluding loss-making firms or including another information variable, will move the results towards dividend displacement and the combination produces results where dividend displacement cannot be rejected, as in model 6, or is marginally rejected, as in model 8. However, in models 6 and 8 we still clearly reject the hypothesis that the coefficients on dividends and other capital changes are the same.

In Table 4 we investigate the impact of including estimates of "core earnings" in models 3, 4, 7 and 8. We restrict the results to a consistent sample so that the impact of including different variables can be separated from any change induced by changing samples. In models 1, 2, 5 and 6, we present the results for the same models as in Table 3, excluding core earnings, but restricted to the core earnings sample. The coefficient on core net income is positive and significant in models 3, 4, 7 and 8 and the inclusion of core net income can be seen to reduce the coefficients on net income, dividends and book value. As in Table 3, whenever either loss-making firms are included in the sample or other information is excluded, dividend displacement is rejected. Other capital displacement is not rejected in the one instance (model 4) where core net income is included, loss makers are excluded and other information is also excluded. In model 8, when core net income is included, loss-making firms are excluded and other information is included, we cannot reject dividend displacement for dividends or for other capital and nor can we reject the hypothesis that the coefficient on dividends and other capital is the same. We designate model 8, in Table 4, as our preferred model.

Our explanation of these results is that dividends are associated with future profitability and will be positively valued where other indicators of profitability are excluded. This will occur where loss-making firms are included and where effective indicators of future profitability such as other information or core earnings are excluded. We test this explanation in sections 4*(iii)* and 4*(iv)* below.

(ii) Sensitivity Tests[10]

(a) Alternative Estimation Procedures

In Tables 3 and 4 we report results based on pooled time-series and cross-sections with two way clustered errors using firm and year as the clustering indicators (Petersen, 2009). However, a number of different approaches have been used in existing research to estimate these models and we test the sensitivity of our results to: i) estimation with coefficients and standard errors derived from annual OLS estimates (Fama and MacBeth, 1973); ii) estimation with standard errors derived from bootstrapping

10 Tabulated results of the sensitivity tests are available from the authors or from early versions of the paper available on SSRN.

Table 4

Valuation Models Including Core Earnings

Model	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*
Sample	*I/B/E/S*	*I/B/E/S* ni_t & $d_t > 0$	*I/B/E/S*	*I/B/E/S* ni_t & $d_t > 0$	*I/B/E/S*	*I/B/E/S* ni_t & $d_t > 0$	*I/B/E/S*	*I/B/E/S* ni_t & $d_t > 0$
$1/bv_t$	4.147***	0.294	3.538***	0.719	3.965***	1.845**	3.639***	1.928**
	(6.90)	(0.44)	(6.12)	(1.04)	(8.01)	(2.96)	(7.48)	(2.94)
bv_t	1.016***	0.133	0.811***	−0.325**	1.548***	0.667***	1.400***	0.289**
	(13.12)	(1.50)	(9.82)	(2.67)	(14.81)	(7.31)	(12.69)	(2.68)
ni_t	3.136***	12.20***	1.904***	6.123***	1.202***	8.690***	0.643*	5.061***
	(9.39)	(16.21)	(9.03)	(9.84)	(3.95)	(12.35)	(2.51)	(8.25)
cni_t			5.631***	9.921***			3.120***	6.673***
			(6.62)	(8.56)			(5.37)	(8.38)
rd_t	7.748***	5.732***	7.941***	4.673***	5.922***	5.112***	6.146***	4.481***
	(6.32)	(4.16)	(6.59)	(3.72)	(5.85)	(4.30)	(6.07)	(3.92)
d_t	11.79***	4.175***	8.502***	1.802	6.631***	1.615	5.139***	0.352
	(13.27)	(3.98)	(9.52)	(1.70)	(8.27)	(1.85)	(6.97)	(0.39)
oc_t	−2.618***	−1.851***	−2.537***	−1.536***	−1.459***	−1.199***	−1.488***	−1.073***
	(6.57)	(4.93)	(6.12)	(4.79)	(4.89)	(4.23)	(4.86)	(4.06)
oi_t					1.407***	1.250***	1.317***	1.087***
					(11.08)	(10.18)	(10.75)	(9.26)
N	13,262	10,005	13,262	10,005	13,262	10,005	13,262	10,005
adj. R^2	0.236	0.425	0.270	0.467	0.374	0.506	0.383	0.524
F-stats:								
$a_4 - a_1 = -1$	161.35***	23.41***	95.09***	9.54**	48.86***	4.89*	36.05***	1.41
$a_5 - a_1 = -1$	44.26***	7.60**	32.19***	0.46	42.17***	8.71**	34.17***	1.63
$a_4 = a_5$	200.89***	29.87***	116.19***	9.67**	80.75***	9.61**	62.83***	2.33

Notes:

The variables are defined as follows: mv_t is the market value of common shares taken six months after the accounting year end, $1/bv_t$ is the deflated intercept of one divided by the book value of equity, ni_t is net income, rd_t is research and development, d_t is ordinary dividends, oc_t is other capital changes such as issues or repurchases, oi_t is our estimate of other information and cni_t is our estimate of core net income. All variables are deflated by current book value of equity at t. The estimated model is:

$$mv_{it} = \alpha_0 + \alpha_1 bv_{it} + \alpha_2 ni_{it} + \alpha_3 rd_{it} + \alpha_4 d_{it} + \alpha_5 oc_{it} + \alpha_6 oi_{it} + \alpha_7 cni_{it} + e_{it}.$$

All regressions are pooled and standard errors are 2-way clustered by year and by firm (Petersen, 2009). Absolute values of the t-statistics are given in parentheses. Coefficients or F-statistics that are statistically significant are identified by * = $p < 0.05$, ** = $p < 0.01$, *** = $p < 0.001$.

techniques; iii) estimation with coefficients and standard errors derived from a pooled cross-section and time-series with annual dummies and standard errors clustered by firm (Petersen, 2009); and iv) and a random effects panel data estimation.[11] For these alternative estimation procedures the dividend coefficients in our preferred model (model 8 in Table 4) are 1.025, 0.352, 0.355 and 1.126, respectively and none are estimated to be significantly different from zero. Only the random effects model rejects dividend displacement, estimating a net effect of paying dividends on value of 0.899 ($p < 0.01$). The other capital changes coefficients are −0.695, 1.073, −0.931 and −0.841 and in all cases they are significantly different from zero at $p < 0.01$ or higher. For the Fama–MacBeth and bootstrapping approaches we reject other capital displacement at $p < 0.001$ and $p < 0.05$ levels, respectively. The coefficient on dividends is estimated to be significantly different from that on other capital changes for the Fama–MacBeth, bootstrapping and random effects approaches at the $p < 0.05$, $p < 0.05$ and $p < 0.01$ levels, respectively.

Thus, the alternative estimation approaches produce results that are broadly consistent with those reported in Table 4. Dividends attract a positive insignificant coefficient and save for the random effects approach dividend displacement cannot be rejected. Other capital changes attract a significant negative coefficient that is more likely to be inconsistent with other capital displacement. The coefficients on other capital and dividends are often significantly different but at marginal levels of statistical significance.

(b) Stability across Different Sub-samples

Our results suggest that dividend displacement cannot be reliably rejected across a broad sample of companies with positive current net income when estimates of core income and other information are incorporated into the model. This result does not mean that dividends are not value relevant for some sub-samples. We investigate four factors that might influence the value relevance of dividends: financial leverage, measured as total debt to equity (Rees, 1997; and Fama and French, 1998); size, measured by market capitalisation; value versus growth, measured as opening market-to-book adjusted for industry differences (Pope and Wang, 2005; and Clubb, 2013); and the expected conditional conservatism of the accounting system, measured by the Khan and Watts conservatism index (Khan and Watts, 2009). The choice of these four variables from the many available metrics we could use to segment the sample is largely driven by Khan and Watts (2009), who show that size, leverage and market-to-book capture many of the other dimensions which may be related to agency and informational dimensions in our sample. These other dimensions include stock market volatility, non-operating accruals, investment cycle, the probability of litigation, probability of informed trading and firm age. The market-to-book variable and the Khan and Watt (2009) indicator of conditional conservatism are also directly related to the suggestion that the coefficient on dividends may be positively associated with conservatism. We split the sample on an annual basis into two equal parts according to the variable of interest and test for dividend and other capital relevance, and equality of the dividend and other capital coefficients, for both sub-samples pooled across our 22 years of available data.

11 The Hausman test confirms that fixed effects and random effects panel data estimates are consistent.

In total we have estimated both dividend and other capital displacement in eight samples. In all cases, except for low conservatism firms, other capital is negative and statistically significant and it is only for low value firms that we can reject other capital displacement ($p < 0.05$). However, the estimated coefficient on dividends is negative in four cases and positive in four, with only the positive result for high conservatism firms significantly different from zero ($p < 0.05$). In the case of low leverage firms ($p < 0.05$), low value firms ($p < 0.05$) and high conservatism firms ($p < 0.01$) dividend displacement is rejected. The result for low value (low opening market-to-book) is surprising. Pope and Wang (2005) suggest that firms with conservative accounting should have a high coefficient on dividends leading to a rejection of dividend displacement. Clubb (2013) agrees that a high dividend coefficient might be expected on dividends but not necessarily rejecting dividend displacement as a compensating high coefficient on book value might also be found. However, the explanation for this apparently perverse result is that for this sample the coefficients on net income, core net income and other information are lower than those estimates on all the other sub-samples. Thus, the rejection of dividend displacement for low value firms, instead of the hypothesised rejection for high value firms, is driven by the failure of the control variables to effectively model expected profitability. The evidence reported here confirms that dividend displacement may not apply to all firms, with three out of eight sub-samples rejecting dividend displacement. However, the results are not sufficiently reliable to confirm or reject particular hypotheses regarding the impact of firm characteristics on dividend displacement.

(c) Value and Firm Characteristics – Capital Expenditure

Our focus is to re-examine the evidence from accounting-based valuation models that conflicts with theories of dividend irrelevance. However, these models have also been used to test the value relevance of a variety of firm characteristics or management actions and, given the instability of the dividends coefficients reported in Tables 3 and 4, we are concerned that the results for other coefficients may also be unstable. One example that receives some support in earlier research is capital expenditure (Rees, 1997; Dedman et al., 2009). Whilst not receiving the level of empirical support or theoretical justification to justify inclusion in the base models used in Tables 3 and 4, we use capital expenditure to test the reliability of the valuation model approach in examining the value relevance of firm characteristics. We re-estimate equation (2) with the addition of a capital expenditure variable. We test the model using: i) the base model using the full I/B/E/S sample; ii) the sample reduced to profitable dividend payers; iii) the full sample including our estimate of other information; iv) the reduced sample including other information; and v) the preferred model with a reduced sample including both other information and our estimate of core earnings. The estimated coefficients on the five models are 1.840 ($p < 0.001$), 0.575 (insignificant), 0.924 ($p < 0.001$), 0.342 (insignificant) and 0.267 (insignificant). The coefficient on the capital expenditure variable is significant and positive whenever the full sample is used and positive but insignificant when it is not. In our preferred model the coefficient on capital expenditure is only 15% of the estimate from the base model. This is consistent with our contention that the valuation model should be used with caution when evaluating the value relevance of accounting choices, firm characteristics or management decisions.

(iii) Testing the Role of Dividends as a Surrogate for Core Earnings and Other Information

We suggest that previous models of value have tended to overstate the value relevance of dividends due to a strong relationship between dividends and core net income as was suggested in Rees (1997), Fama and French (1998) and Giner and Rees (1999). In a model where core income is important to value, yet is inadequately captured in the explanatory variables, the coefficient on dividends will tend to become inflated if it is correlated with the omitted core income variable. The same rationale applies to other information. Where other information is associated with value, is correlated with dividends and is omitted from the model, the coefficient on dividends will again be inflated. In Table 5 we report the results of our models of core income (models 1 to 4) and other information (models 5 to 8) including all remaining explanatory variables from our valuation models. In models 1, 3, 5 and 7 we use the full sample and in 2, 4, 6 and 8 we restrict the model to profitable dividend-payers.

As can be seen from Table 5, dividends are strongly positively associated with core net income and with other information. In all eight models, the slope coefficient on dividends is statistically significant but, in models where the sample is restricted to profitable dividend payers, the coefficient declines considerably yet remains positive and statistically significant. Where other information is added to the model of core net income, and where core net income is added to the model of other information, the coefficient on dividends declines marginally but remains strongly significant. The net impact of dividends in the explanatory models requires an adjustment for the impact of dividends on the book value of equity, but in all instances the coefficient on book value is minor and the net impact and gross impact of dividends on either core net income or other information remains statistically significant.

The other capital changes coefficients are also typically negative and significant except for models 1 and 3 for core net income, and after adjustment for the impact of the book value of equity they exhibit a significant negative effect in all models except 7 and 8. In all instances the coefficient on dividends and other capital changes are significantly different.

(iv) Dividends as Predictors of Subsequent Earnings

In Table 6 we report the results of the models predicting net income and expected net income. The two measures of expected earnings potentially have different implications. Value is a function of expected earnings but actual earnings includes unexpected elements that will often be transient whilst expected net income includes biases introduced by the analysts (Ramnath et al., 2008). Thus, both measures of expectations are imperfect and we treat it as an empirical question as to which is the better measure. In Table 6 we report the results of the model of next year's net income with model 1 for the full sample, model 2 restricted to profitable dividend payers repeated as models 3 and 4 but with core net income added. In models 5 to 8 we repeat the analysis but with forecast net income as the dependent variable.

It is clear that whenever the sample includes loss-making firms (models 1, 3, 5 and 7) the coefficients on net income are relatively low and the coefficient on dividends relatively high. The dividend effect is significantly different from zero in all instances and the net effect after allowing for the impact on the book value of equity is also

Table 5

Models of Core Earnings and Other Information

Model	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*
Dep. var.	cni_t	cni_t	cni_t	cni_t	oi_t	oi_t	oi_t	oi_t
Sample	*I/B/E/S*	*I/B/E/S* ni_t & $d_t > 0$	*I/B/E/S*	*I/B/E/S* ni_t & $d_t > 0$	*I/B/E/S*	*I/B/E/S* ni_t & $d_t > 0$	*I/B/E/S*	*I/B/E/S* ni_t & $d_t > 0$
$1/bv_t$	0.108***	−0.0428*	0.104***	−0.0126	0.129	−1.241***	−0.0769	−1.113***
	(5.34)	(2.32)	(5.40)	(0.71)	(0.82)	(6.44)	(0.48)	(6.13)
bv_t	0.0364***	0.0462***	0.0473***	0.0566***	−0.378***	−0.427***	−0.447***	−0.565***
	(8.90)	(15.11)	(12.81)	(17.12)	(14.64)	(13.45)	(16.60)	(16.62)
ni_t	0.219***	0.612***	0.179***	0.544***	1.375***	2.808***	0.957***	0.978***
	(15.00)	(27.66)	(13.02)	(24.06)	(17.19)	(19.20)	(10.31)	(4.00)
rd_t	−0.0343	0.107***	−0.0718**	0.0946***	1.297***	0.496	1.362***	0.177
	(1.28)	(3.79)	(2.70)	(3.55)	(6.45)	(1.69)	(6.60)	(0.65)
d_t	0.584***	0.239***	0.478***	0.189***	3.666***	2.049***	2.553***	1.334***
	(13.94)	(6.85)	(12.33)	(5.87)	(13.12)	(6.67)	(7.51)	(4.38)
oc_t	−0.0144	−0.0317***	0.00939	−0.0190**	−0.824***	−0.521***	−0.796***	−0.427***
	(1.22)	(4.07)	(0.81)	(2.76)	(9.63)	(5.72)	(8.33)	(5.06)
oi_t			0.0289***	0.0244***				
			(10.00)	(11.94)				
cni_t							1.906***	2.989***
							(8.43)	(9.22)
N	13,262	10,005	13,262	10,005	13,262	10,005	13,262	10,005
adj. R^2	0.386	0.703	0.420	0.724	0.273	0.334	0.313	0.383
F-stats:								
$\beta_4 - \beta_1 = 0$	151.33***	29.89***	111.09***	16.54***	209.47***	67.22***	82.03***	41.76***
$\beta_5 - \beta_1 = 0$	24.16***	83.86***	13.37***	97.47***	29.80***	1.35	13.78***	2.99
$\beta_4 = \beta_5$	152.23***	45.70***	109.50***	30.96***	270.56***	76.38***	83.91***	33.46***

Notes:

The variables are defined as follows: mv_t is the market value of common shares taken six months after the accounting year end, $1/bv_t$ is the deflated intercept of one divided by the book value of equity, ni_t is net income, rd_t is research and development, d_t is ordinary dividends, oc_t is other capital changes such as issues or repurchases, oi_t is our estimate of other information and cni_t is our estimate of core net income. All variables are deflated by current book value of equity at *t*. The estimated models are:

$$cni_{it} = \beta_0 + \beta_1 bv_{it} + \beta_2 ni_{it} + \beta_3 rd_{it} + \beta_4 d_{it} + \beta_5 oc_{it} + \beta_6 oi_{it} + e_{it}, \quad \text{and}$$

$$oi_{it} = \beta_0 + \beta_1 bv_{it} + \beta_2 ni_{it} + \beta_3 rd_{it} + \beta_4 d_{it} + \beta_5 oc_{it} + \beta_7 cni_{it} + e_{it}.$$

All regressions are pooled and standard errors are 2-way clustered by year and by firm (Petersen, 2009). Absolute values of the *t*-statistics are given in parentheses. Coefficients or *f*-statistics that are statistically significant are identified by * = $p < 0.05$, ** = $p < 0.01$, *** = $p < 0.001$.

Table 6
Tests of Predictive Ability

Model	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*
Dep. var.	ni_{t+1}	ni_{t+1}	ni_{t+1}	ni_{t+1}	fni_{t+1}	fni_{t+1}	fni_{t+1}	fni_{t+1}
Sample	*I/B/E/S*	*I/B/E/S* ni_t & $d_t > 0$	*I/B/E/S*	*I/B/E/S* ni_t & $d_t > 0$	*I/B/E/S*	*I/B/E/S* ni_t & $d_t > 0$	*I/B/E/S*	*I/B/E/S* ni_t & $d_t > 0$
$1/bv_t$	−0.0875	−0.0944	−0.0591	−0.0174	0.270***	0.145***	0.166***	0.135***
	(1.72)	(1.32)	(0.92)	(0.40)	(6.48)	(3.67)	(4.15)	(4.08)
bv_t	0.0114	−0.00752	−0.000824	−0.0332***	0.0966***	0.0441***	0.0600***	−0.0184***
	(1.32)	(1.09)	(0.09)	(3.81)	(14.60)	(8.90)	(12.60)	(4.33)
ni_t	0.608***	0.976***	0.552***	0.697***	0.236***	0.774***	0.125***	0.101**
	(16.46)	(19.12)	(10.90)	(12.09)	(9.36)	(21.88)	(6.56)	(2.95)
cni_t			0.336***	0.484***			0.744***	1.182***
			(7.48)	(6.28)			(19.70)	(16.68)
rd_t	−0.0716	−0.0500	−0.0461	−0.0879	−0.107*	0.152**	−0.0478	0.0167
	(1.48)	(1.04)	(1.11)	(1.70)	(2.30)	(3.29)	(1.44)	(1.34)
d_t	0.631***	−0.00959	0.373***	−0.125*	0.888***	0.248***	0.452***	0.0250
	(7.54)	(0.15)	(5.83)	(2.07)	(13.12)	(3.86)	(11.11)	(0.93)
oc_t	0.0571*	−0.0171	0.0533*	−0.00821	0.0200	−0.0363**	0.0171	−0.0134*
	(2.09)	(0.68)	(2.24)	(0.33)	(1.23)	(3.10)	(1.04)	(2.08)
oi_t	0.00157	0.0146*	−0.000132	0.00728	0.0411***	0.0388***	0.0210***	0.00789**
	(0.25)	(2.30)	(0.02)	(1.21)	(11.24)	(10.20)	(6.31)	(3.22)
N	14,254	10,282	12,298	9,378	15,388	10,956	13,262	10,005
adj. R^2	0.268	0.279	0.263	0.285	0.324	0.634	0.527	0.852
F–stats:								
$\gamma_4 - \gamma_1 = 0$	48.77***	0.28	31.88***	2.17	122.84***	9.73***	87.55***	2.88*
$\gamma_5 - \gamma_1 = 0$	2.73*	0.20	5.29*	0.95	33.97***	51.24***	9.30***	0.36
$\gamma_4 = \gamma_5$	41.92***	0.52	24.95***	4.73*	135.54***	15.94***	82.18***	1.97***

Notes:
The variables are defined as follows: mv_t is the market value of common shares taken six months after the accounting year end, $1/bv_t$ is the deflated intercept of one divided by the book value of equity, ni_t is net income, rd_t is research and development, d_t is ordinary dividends, oc_t is other capital changes such as issues or repurchases, oi_t is our estimate of other information and cni_t is our estimate of core net income. All variables are deflated by current book value of equity at t. The estimated models are:

$$ni_{it+1} = \gamma_0 + \gamma_1 bv_{it} + \gamma_2 ni_{it} + \gamma_3 rd_{it} + \gamma_4 d_{it} + \gamma_5 oc_{it} + \gamma_6 oi_{it} + \gamma_7 cni_{it} + e_{it}, \quad \text{and}$$

$$fni_{it+1} = \gamma_0 + \gamma_1 bv_{it} + \gamma_2 ni_{it} + \gamma_3 rd_{it} + \gamma_4 d_{it} + \gamma_5 oc_{it} + \gamma_6 oi_{it} + \gamma_7 cni_{it} + e_{it}.$$

All regressions are pooled and standard errors are 2-way clustered by year and by firm (Petersen, 2009). Absolute values of the t-statistics are given in parentheses. Coefficients or F-statistics that are statistically significant are identified by * = $p < 0.05$, ** = $p < 0.01$, *** = $p < 0.001$.

significant. When the sample is restricted to profitable dividend-payers dividends no longer have any predictive value for subsequent net income but they continue to have a positive and statistically significant incremental predictive value for forecast net income. When core net income is introduced to the model it attracts a statistically significant positive coefficient and the coefficient on dividends declines. However, the main insight from these results is that, once loss-makers are removed from the sample, dividends do not predict future net income but do predict forecast net income. Clubb (2013) provides a model where dividends incrementally predict future residual income and hence have a positive association with value. In that model dividends may, after adjustment for their impact on value through the coefficient on the book value of equity, still exhibit dividend displacement.

5. CONCLUSION

Using a large and recent sample of publicly quoted UK firms spanning 22 years, we replicate previous results which show that dividends have a strongly significant and positive coefficient in a conventional model of firm value. However, if we improve the competing information set by restricting the sample to profitable dividend-paying firms, or by including proxies for either core income or other information, the coefficient on dividends becomes much lower. When the sample is restricted and both other information and core earnings are included we are unable to reject dividend displacement, other capital displacement or equality between the coefficients on dividends and other capital changes. Our examination of the relationship between dividends and a) core earnings, b) other information, and c) expected earnings demonstrates that the main driver of our results is the relationship between dividends and expected earnings. Where the model specification is effective in including indicators of expected earnings, dividends have an impact on value that is broadly consistent with dividend displacement. Where the independent variables in the model other than dividends are ineffective in modelling expectations, dividends have a strong positive relationship with value.

Our conclusion that dividend displacement cannot be rejected requires that we restrict the analysis to a sub-sample where we are confident in the experimental setting. This approach differs from many existing market-based accounting research papers where it is more common to strive for the largest sample possible. This is understandable, but we seek to investigate an anomalous result and one that we clearly show is influenced by the model specification and sample composition. In these circumstances it is important to identify those elements of the sample or characteristics of the model that lead to apparent positive value relevance for dividends. The sample we are left with consists of profitable, dividend-paying firms for which analysts' forecasts are available. These are not unusual firms.

Our results do not demonstrate that dividends are never value relevant. Indeed recent German evidence derived from a short window event study of dividend surprise suggests that dividends may convey price relevant information (Andres et al., 2013). Furthermore both Pope and Wang (2005) and Clubb (2013) suggest that accounting conservatism may drive a positive coefficient on dividends and taxation, agency and signalling explanations for dividend value relevance have been often postulated (Clubb and Walker, 2012). In eight sub-samples we reject dividend displacement three times and when we estimate the preferred model for the full sample using a panel-data approach we again reject dividend displacement. There appears to be the potential to further investigate the relationship between dividend value relevance and both accounting conservatism and firm characteristics.

However, our results clearly establish that the driving characteristic of the coefficient on dividends is the relationship between dividends and expected earnings given the predictive power of other variables in the model. Excluding loss-making firms increases the predictive ability of current earnings and including either other information or core earnings reduces the information content of dividends. Under these circumstances any value relevance of dividends arising from accounting conservatism or firm characteristics is masked by the variation in the predictive ability of dividends.

Our results imply that dividend displacement is a reasonable initial assumption regarding the relationship between dividends and value for the typical profitable dividend-paying firms. They also explain why a long list of earlier papers, including Rees (1997), Fama and French (1998), Giner and Rees (1999), Akbar and Stark (2003), Hand and Landsman, (2005), Pinkowitz et al. (2006), Dittmar et al. (2007), Poletti Hughes (2008), Dedman et al. (2009), Gregoriou (2010) and Dedman et al. (2012) report results where dividends appear to have a strong positive impact on value. We also show, using capital expenditure as an example, that using an accounting-based valuation model to assess the value relevance of firm characteristics or accounting information is potentially unreliable. For a restricted sample where expectations can be effectively modelled the approach may be appropriate but researchers should take care when selecting their experimental setting.

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