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ABSTRACT

German firms pay out a lower proportion of their cash flows than UK and US firms. However, on a published profits basis, the pattern is reversed. Company law provisions and accounting policies account for these conflicting results. A partial adjustment model is used to estimate the implicit target payout ratio and the speed of adjustment of dividends towards a long run target payout ratio. We find that German firms do not base their dividend decisions on published earnings, but on cash flows. The reasons for the use of a cash flow-based payout policy are: (i) published earnings figures do not correctly reflect corporate performance as German firms tend to retain a significant part of their earnings to build up legal reserves, (ii) the conservative nature of German accounting policies, (iii) published earnings are subject to a higher degree of smoothing than cash flows. Regarding the speed of adjustment of dividends towards the long term target payout ratio, UK and US companies only slowly adjust their dividend policy whereas German are more willing to cut the dividend in the wake of a temporary decrease in profitability. This causes a higher degree of 'discreteness' in the dividends-per-share time series as opposed to the 'smoothness' (i.e., frequent annual small adjustments in the dividend per share) observed in the US and the UK.

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1. Introduction

Lintner's (1956) empirical observation that firms gradually adjust dividends in response to changes in earnings, has acquired the status of a stylized fact on corporate dividend policy.[1] His seminal work suggests that managers change dividends primarily in response to unanticipated and non-transitory changes in their firm's earnings, and they have reasonably well-defined policies in terms of the speed with which they adjust dividends towards a long run target payout ratio. Empirical studies, such as Fama and Babiak (1968), confirm Lintner's original findings.

As most of the empirical evidence is on UK and US data, little is known about the dividend policy and the explanatory power of dividend models for the case of continental European firms. Whereas in Goergen *et al.* (2004) we explain changes and omissions in dividends, in this paper we estimate the empirical relation between dividends and earnings in Germany by applying Lintner's 'partial adjustment model' and using the Generalized Method of Moments (GMM-in-systems). One of the previous studies that addressed this issue is Behm and Zimmermann (1993). However, their results are based on a sample of the 32 largest German firms only. They estimate the Lintner model for the period 1962-88 and conclude that it reasonably fits both aggregate and individual firm data.

We examine whether German firms have a long-term target payout ratio. In addition, we investigate whether the target payout ratio is based on published earnings or on cash flow. We also study how the dividend adjustment process takes place. This paper improves on earlier research by using a more advanced estimation methodology, a larger and more representative sample, a longer time window and different proxies for profitability. Specifically, we improve the methodology along the following lines. First, we use panel data on 221 industrial and commercial quoted firms for the ten-year period from 1984 to 1993. This sample covers more than 50 per cent of the German industrial and commercial quoted companies. The reason why we opt for this period is that it encompasses a five-year period of economic boom followed by an economic recession. Unlike earlier studies (e.g. Behm and Zimmermann 1993), we exclude financial companies as these firms may have different considerations in establishing their investment and dividend policies. Second, earlier studies on German dividend policy did not control for unobserved firm-specific effects which might

[1] See Marsh and Merton (1986) and Brealey and Myers (2003).

be correlated with other explanatory variables causing Ordinary Least Squares (OLS) and Within-Groups estimators to be biased and inconsistent. We use the Generalized Method of Moments technique developed by Arellano and Bond (1991), Blundell and Bond (1998) and Arellano and Bover (1995). Finally, we do not only use published bottom line earnings as an explanatory variable but also cash flows which have the advantage that they are less subject to conservatism in German accounting methods (e.g., the legal requirement to add earnings to reserves).

The paper is structured as follows. In the next section, we discuss the dividend models estimated in previous studies. We continue in Section 3 with some institutional aspects such as profit transfers from a subsidiary to its parent company in Germany, dividends on preference shares and German accounting policies. We then describe our data set and provide descriptive statistics in Section 4. In Section 5, we first discuss the relevant econometric issues. We then report the econometric results and present some tests to ascertain the robustness of these results. Section 6 concludes.

2. Dividend Models

Marsh and Merton (1987: 3) argue that the 'controversy regarding normative theories of dividends [namely, based on the relaxation of the assumptions underlying the Miller-Modigliani (1961) theorem of dividend irrelevance], has led empirical researchers to rely heavily on positive approaches to specify their models'. Lintner (1956) was the first to propose a positive dividend-earnings model and his work laid the fundaments of the vast subsequent dividend literature. He conducted interviews with 28 carefully selected US companies to investigate the rationale behind their dividend policy. His fieldwork revealed considerable differences in dividend policies across companies but he also unveiled some common patterns. Marsh and Merton (1986) summarize these patterns as follows:

(1) managers believe that firms should have some long term target payout ratio;

(2) in the dividend decision, managers focus on the change in current payouts and not on the dividend level;

(3) a change in dividends is usually triggered by a major unexpected and persistent change in earnings;

(4) most managers try to avoid changing the dividends if there is a high probability that this dividend change may be reversed within one year or so.

Based upon these facts, Lintner (1956) formalizes corporate dividend behaviour as a *partial adjustment model*. For any year t, the target level of dividends, D^{*}_{it} for firm i, is related to current earnings, E_{it}, by a desired payout ratio r_i:

$$D_{it}^{*} = r_i E_{it} \tag{1}$$

In any given year the firm will only *partially* adjust to the target dividend level. Hence, we have:

$$D_{it} - D_{i,t-1} = a_i + c_i (D_{it}^{*} - D_{i,t-1}) + u_{it} \tag{2}$$

where a_i is a constant; c_i is the speed-of-adjustment coefficient, with $0<c_i\leq 1$; $D_{it} - D_{i,t-1} = \Delta D_{it}$ is the actual change in the dividend and $(D_{it}^{*} - D_{i,t-1})$ is the desired change in the dividend.

If $a_i = 0$ and $c_i = 1$, the actual changes in dividends coincide with the desired changes. Conversely, if $c_i = 0$, no changes in dividends towards the desired level are undertaken since the actual change at time t is the same as the one observed in the previous time period. The hypothesis that firms gradually adjust dividends in response to changes in earnings and thus apply dividend smoothing implies that the speed-of-adjustment coefficient c_i is within the range $0<c_i<1$. Furthermore, a positive a_i represents the management's resistance to reduce dividends.

The adjustment process (2) can be written as

$$D_{it} = a_i + c_i D_{it}^{*} + (1 - c_i) D_{i,t-1} + u_{it} \tag{3}$$

Now substitution of (1) into (3) gives

$$D_{it} = a_i + c_i r_i E_{it} + (1 - c_i) D_{i,t-1} + u_{it} \tag{4}$$

One obtains the following empirically testable equation:

$$D_{it} = a_i + b_i E_{it} + (1 - c_i) D_{i,t-1} + u_{it} \tag{5}$$

with $r_i = b_i / c_i$ being the payout ratio and c_i the speed of adjustment coefficient.

Alternatively, the empirically testable equation (5) can be obtained by using an *adaptive expectations model*. In this model, current dividends are assumed to be a function of long run expected earnings:

$$D_{it} = r_i E_{it}^{*} + u_{it} \tag{6}$$

As the expectations variable E^{*}_{it} is not directly observable, we assume that earnings expectations are formed according to the following process:

$$E_{it}^{*} - E_{i,t-1}^{*} = d_i(E_{it} - E_{i,t-1}^{*}) \tag{7}$$

where d_i is the coefficient of earnings expectations. This equation signifies that the expectations about earnings are revised each period by a fraction d_i of the discrepancy between the earnings observed in the current period and those that had been anticipated in the previous period. By substitution, equation (5) is obtained (but without the constant term).

A *combination of the adaptive expectations and partial adjustment models* yields a different model. Here we assume that dividends follow the adjustment mechanism formulated in (3). In addition, target dividends are proportional to long run expected earnings

$$D_{it}^{*} = r_i E_{it}^{*} \tag{8}$$

with long run expected earnings given by

$$E_{it}^{*} - E_{i,t-1}^{*} = e_i(E_{it} - E_{i,t-1}^{*}) \tag{9}$$

We finally obtain an empirically testable equation with a constant, E_{it}, $D_{i,t-1}$ and $D_{i,t-2}$.

Fama and Babiak (1968) extend the partial adjustment model by including a lagged earnings variable. They assume that the process generating the annual earnings of firm *i* is as follows

$$E_{it} = (1+\lambda_i)E_{i,t-1} + v_{it} \tag{10}$$

where v_{it} is a serially uncorrelated error term. Target dividends are defined as in the partial adjustment model (1). A further assumption is that there is full adjustment of dividends to the expected earnings $\lambda_i E_{i,t-1}$, and partial adjustment to the remainder:

$$D_{it} - D_{i,t-1} = a_i + c_i\left[r_i(E_{it} - \lambda_i E_{i,t-1}) - D_{i,t-1}\right] + r_i\lambda_i E_{i,t-1} + u_{it} \tag{11}$$

which rearranged, gives

$$D_{it} = a_i + (1-c_i)D_{i,t-1} + c_i r_i E_{it} + r_i\lambda_i(1-c_i)E_{i,t-1} + u_{it} \tag{12}$$

yielding the following empirically testable equation

$$D_{it} = a_i + (1-c_i)D_{i,t-1} + b_i E_{it} + d_i E_{i,t-1} + u_{it} \tag{13}$$

where $b_i = c_i r_i$ and $d_i = r_i \lambda_i (1-c_i)$.

There has been extensive (early) empirical research confirming Lintner's findings (amongst others: Fama and Babiak (1968), Pettit (1972), Watts (1973)).

There are three different approaches to the econometric estimation of dividend behaviour. The first two are micro-econometric approaches. The first one uses time series for individual firms and allows for firm-specific slope coefficients. The second one uses a panel of data – a cross-section of firms repeated over a short period – and imposes common slope coefficients. The latter allows for restricted variation in the target dividend payout ratio across firms. Given that the length of our time series is limited to 10 years of data, we will opt for a panel data approach. The third approach is the macro-econometric model developed by Marsh and Merton (1986). They assume permanent economic earnings, as proxied by stock market prices (and not accounting earnings), to be the fundamental determinant of dividends.

3. The institutional framework in Germany

The purpose of this section is to provide a brief overview of some important issues concerning German dividend policy.[2] The issues are: (i) 'control agreements' which may apply to firms with a large shareholder, (ii) preference shares which earn a guaranteed dividend, (iii) share repurchases, and (iv) German accounting rules.

Some quoted German companies have 'control agreements' with their parent company. There are two possible types of control agreements: a Profit and Loss Agreement (which we call PLA) and a Subordination of Management Agreement (SMA).[3] An SMA requires the controlling company to absorb any losses but the transfer of profit is optional. A PLA implies a transfer of both profits and losses to the controlling company. Hence, the pertinent question is whether companies with such agreements should be included in this study.

We decide to exclude these firms from our analysis for two reasons. First, the rationale of these control contracts is to benefit from possible tax losses carried forward at the level of the subordinate company. The controlling company can then absorb these losses and offset them against its profits so as to reduce its tax bill, as in Germany, like the UK but unlike the US, the taxable profit is based on the accounts of the individual companies in the group. Hence, the amount transferred to the parent company is not a dividend, but is direct result from the effort to reduce the tax liability of the parent company. Second, financial reports are very difficult to interpret in these cases. Often the profit is not disclosed, but the amount (which may be positive or negative) that is transferred to the parent company as well as the dividend

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[2] Further details on the institutional settings can be found in chapter 5 of Correia *et al.* (2004) and Goergen *et al.* (2004).

[3] Both agreements require the approval of at least 75 per cent of the voting capital represented at general meetings of both the controlling and subordinate companies. Note that the existence of a controlling shareholder does not necessarily imply the existence of either PLA or SMA type of agreements.

per share paid to the ‘free’ shareholders (the minority shareholders of the controlled company) is shown. One way to deal with this sample exclusion bias is to use consolidated accounts. If the parent firm is publicly quoted, the transfers from the subordinate firm to its parent company will be reflected in the parent firm’s financial report, and therefore these subordinate firms will be recorded (indirectly) in our sample. This is one reason why consolidated accounts have been used in this study. The other reason relates to provisions concerning the profit distribution, to which we now turn.

Paragraph 150 of the German Stock Corporation Act (AktG §150) regulates the profit distribution. The company has to build up a legal reserve from its profits in the balance sheet. The annual profit, net of the transfer to the legal profit reserve, is then the basis for distribution according to the provisions of AktG §58, which basically state that the management board and the supervisory board, without consulting the shareholders,[4] can retain part, but no more than half, of the annual profits. In other words, this provision requires companies to pay out at least 50 per cent of their current profits as dividends. However, this is not the case for all companies as other requirements such as legal reserves and special provisions (such that the management board may be authorized to transfer up to 100 per cent of the year’s profit to profit reserves) in the articles of association of companies mitigate the impact of AktG §58.

An implication of these provisions is that profits shown in group accounts are generally larger than those shown in the unconsolidated, parent AG. Legally, when deciding on the dividend policy of the firm, the (parent’s) management only has to take into consideration the profit of the parent (unconsolidated) company. However, in practice, group accounts play a fundamental role in the dividend payout decision. If the holding company’s results were substantially lower than the group’s accounts, shareholders could demand either an explanation or a higher dividend. Thus, for the purposes of this study, we opted for the group’s profit as the profit measure.[5]

Preference shares are frequently issued by German corporations (see chapter 5 of Correia et al. (2004)). In almost all cases, they carry no voting rights,[6] but are entitled to a minimum

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[4] As long as there is no control agreement between the controlling and subordinate companies.

[5] Harris *et al.* (1994) show that consolidation increases the value relevance of accounting measures for German companies.

[6] Except in a few cases where the term *preference share* refers to shares with multiple-voting rights rather than to a preferential dividend.

cumulative preferred dividend. In general, if this dividend is not paid during two consecutive years then the preference shares become voting shares. Preference shares are not only given priority in terms of the dividend they receive, but also receive an excess dividend of usually between DM1 to DM2 per share.[7] These stock corporation provisions basically ensure that firms which are fully controlled by one or a few shareholders and which have issued quoted preference shares, do not adopt dividend policies that favour the large shareholders at the expense of the minority non-voting shareholders.

In Germany, public corporations are generally not allowed to buy their shares back (AktG §§ 71-71e). There are a few exceptions. For example, a company can acquire its own shares up to a total of 10 per cent of its share capital if this repurchase is necessary to avoid serious damage to the company (i.e., loss of property or assets), or with the intention to offer them to the employees of the company.

Finally, one further issue. German accounting is often considered to be particularly deficient in the information disclosed to investors. The German system has traditionally encouraged a certain degree of conservatism (see Harris *et al.* (1994) for an overview of the system). In particular, the three following factors contribute to a conservative bias in the profit figure disclosed. First, there is some degree of prudence in terms of asset valuation, as the imparity principle requires unrealized losses to be recognized but not unrealized gains. Second, as a consequence of the link established by the AktG §58 (see above) between dividends and earnings, managers have incentives not to report earnings that attain a desired dividend policy because higher reported earnings may create shareholder pressure for higher dividends.[8] Third, the existence of pension provisions may also account for a certain downward bias in the published profit figure. We will shortly come back to this point.

In the light of conservative accounting information, we provide an alternative measure of corporate profitability. We define cash flows as zero distribution profits, gross of depreciation and changes in long term provisions. As this definition merits an explanation,

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[7] In other words, where there are dual-class shares of this type, distributed profits are first accorded to preference shares and in case there is current profit left, ordinary shares start to receive a dividend. Once the amount paid to ordinary shares reaches the amount accorded to preference shares and if there is further profit left, the marginal increase in dividends paid is the same for both types of shares although the preference shares generally receive a small premium in excess of the ordinary shares.

[8] Although one should bear in mind all these difficulties when interpreting German accounts, there is no empirical evidence that reported earnings in Germany have less value relevance than those in other

we briefly discuss (i) zero distribution profits and dividend related taxation, (ii) depreciation and (iii) pension and other provisions.

(i) The German tax system affects measured profits and dividend payout ratios.[9] If dividends are taxed differently than retained earnings, then corporate tax liabilities are sensitive to dividend distributions. The convention that has been used in this case is to measure profits by zero dividend distribution profits and these are defined as:

$$\frac{D(1-t_c)}{(1-t_d)} + R \tag{14}$$

where t_d accounts for the tax rate on dividends distributed, t_c for the tax rate on retained profits, $D(1-t_c)$ are net dividends (i.e., dividends net of tax), $D/(1-t_d)$ are gross dividends and R are earnings retentions. To understand how dividends in Germany affect tax liabilities, assume that a firm makes a loss. If it omits its dividend, then there will be no tax liability. However, if it decides to pay out a dividend despite its loss, then there will be a tax liability (equal to t_d times the dividend distribution).

(ii) Depreciation is included as it is merely a bookkeeping transaction that does not involve cash inflows or outflows.

(iii) Long term provisions are defined as the sum of provisions for pensions, and other provisions. The inclusion of pension provisions in the calculation of the cash flow deserves a comment because, e.g., in the UK this item is not significant. In one respect, the pension provisions should be regarded as a liability (from the company towards the employees) and therefore it should not be part of retentions. However, in our view, there is a strong case for considering it as a form of cash flow. Edwards and Fischer (1994, Table 3.4, p.66) report that, between 1970 and 1989, this amount accounted for approximately 6 per cent of the non-financial enterprise sector internally generated funds. The authors also argue that firms frequently have a high degree of discretion over the way in which pension provisions are invested. This is another reason why the bottom line profit figure may be so conservative in

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countries. For example, Harris *et al.* (1994) argue that German reported earnings have informational content similar to those of the US.

[9] See Mayer and Alexander (1990) for a more detailed discussion of the issue.

Germany. Therefore, we opt for the inclusion this item in the cash flow figure. The item ‘other provisions’ is net of tax provisions, such as deferred taxation.

4. Sample and Data Description

4.1 Sample

We select all of the 221 industrial and commercial firms that are quoted in at least one of the eight German Stock Exchanges (GSE), and for which there are at least five years of accounting data available over the ten-year period from 1984 to 1993. The reason why we choose this period is that it corresponds to a five-year period of economic growth followed by a period of economic slow down. Thirteen firms leave the stock market and go private, six go bankrupt, five are taken over and two put in place a ‘control agreement’ during the period of analysis. Thirty-six firms obtain a listing in a year after 1984, but all sample firms are quoted in 1989. Overall, the sample consists of an unbalanced panel data of 2098 firm-year observations (see Table 1).

[INSERT TABLE 1 ABOUT HERE]

Accounting data are collected from *Saling Aktienführer*, an annual publication which provides information on balance sheet and profit and loss account items, historical data on equity raised on the stock exchanges, shareholdings, share prices, date of first quotation, etc. From this source, the following data are gathered for the ten-year period 1984-93: published after-tax earnings, depreciation, changes in pension provisions and other provisions, dividends per share for both preference and ordinary shares, and the number of ordinary and preference shares at the end of the accounting year to which the dividend per share refers. The dividend per share figures are adjusted for share splits.

4.2 Definitions and data issues

We use gross dividends, defined as cash dividends gross of corporation tax levied on dividend distributions. Preference shares are often issued on the German Stock Exchanges: in 20 per cent of our sample (44 cases out of a total of 221), preferred stock was listed in at least one year during the period 1984-93. To account for dividends on preferred stock, we calculate a weighted average of the dividend paid on ordinary and preference shares. The weights consist of the ratios of the share capital issued as preference shares and ordinary shares, respectively, divided by the total market value of the total equity capital outstanding.

The weighted average dividend per share is hence calculated as follows. Let N_T be the total number of shares outstanding, N_o the number of ordinary shares, and N_p the number of preference shares. Thus, $N_T = N_o + N_p$. Moreover, let DPS_o be the dividend per share paid on ordinary shares, and DPS_p the dividend per share paid on preference shares, then the weighted average dividend per share (*WDPS*) equals:

$$WDPS = \frac{DPS_o \times N_o + DPS_p \times N_p}{N_T} \tag{15}$$

Using this formula, the weighted total dividend per share exceeds the dividend per ordinary share by approximately 4.5 per cent.

UK studies typically consider only dividends on ordinary shares (see, e.g., Bond *et al.* (1996), Edwards *et al.* (1986)). Even for Germany, the issue of dividends on preferred equity may be less empirically relevant in the context of panel data estimations because the movements in dividends per share are equal for the two classes of shares in virtually all our sample firms. In other words, when dividends per ordinary share increase, for example, the dividend per preference share increases by a similar percentage. Only in 3 German firms (out of the 44 with preference shares), the change in dividends per ordinary share was different from the change per preference share. Furthermore, the change is only different in situations of dividend omissions or dividend initiations, which is consistent with the fact that there is generally a dividend premium paid on preference shares. To conclude, our data suggest that the degree of flexibility in choosing the level of dividends on preference shares is similar to the one on ordinary shares.

A striking fact is the high incidence of ‘specially designated dividends’ paid by German corporations. We find that such payments occurred in 191 of the 2,098 firm-year observations, i.e., 9 per cent of the whole sample. These special dividends predominantly reflect shifts in the dividend policy rather than transitory increases in dividends and earnings. Brickley (1983), who studies the dividend payouts and earnings of a sample of US firms in the year following the announcement of special dividends, also subscribes to this view. In 10 firm-years, we observe large one-off payments associated with either ‘special anniversaries’, or with sales of subsidiaries (in one case), or with distributions of reserves previously accumulated at a different rate of taxation. The fundamental problem with these large payments is one of timing, i.e., to which accounting years should these payments be allocated? As we do not have enough information allowing us to allocate these payments to specific accounting years, we exclude these payments (as do Behm and Zimmermann (1993)).

Two earnings figures are employed: (a) after-tax earnings as published in the annual reports, and (b) cash flows defined as zero distribution earnings gross of depreciation and changes in provisions.[10] Both measures of earnings were divided by the number of shares outstanding at the end of each accounting year to obtain a per-share figure.

We use consolidated data for the following reasons. First, the use of consolidated data ensures that the fact that we exclude firms under 'control agreements' does not create a sample exclusion bias. These firms are indirectly included in our data via the accounts of the quoted parent company if the latter is in our sample. Second, the dividend policy of the parent company is, in practice, determined after consideration of the annual consolidated accounts. However, a problem arises from working with consolidated accounts. We have 14 sample firms that are owned by other corporations which, in turn, are also in our sample. Such a double-counting issue may create a bias in our estimations. A typical example is Renk AG, who was owned by MAN AG over our sample period. The size of these 14 firms is usually very small compared to their parent companies. The average market capitalization of Renk AG is 8 per cent of the market capitalization of the average sample firm, and only 3 per cent of the market capitalization of MAN AG (which is 3 times as large as the average listed firm). We will investigate whether the double-counting problem biases our results, by performing a re-estimation excluding these 14 firms.

We use the Commerzbank Industry Classification and classify all 221 firms into nine industry categories. As a proxy measure for size, we calculate the market capitalization for all firms on an annual basis by averaging the market capitalization at the end of each quarter.[11]

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[10] Behm and Zimmermann (1993) use 'net profits', a figure that is suggested by the German Financial Analysts Association. However, data on net earnings are not available for all firms in our sample and negative 'net profits' are not reported.

[11] As for 76 firm-year observations, the ordinary shares are not quoted whereas the preference shares are, we multiply the total number of ordinary and preference shares by the price of the listed preference share.

4.3 Some descriptive statistics

Some descriptive statistics of the dividends, earnings and cash flow series for the whole period are summarized in Table 2. A first striking result is that published earnings account for only 25 per cent of the cash flow. Hence, the mean dividend payout ratio on a published earnings basis is significantly higher than the equivalent ratio on a cash flow basis: 86 and 21.4 per cent, respectively. This also suggests that the published earnings figure is rather conservative. Behm and Zimmermann (1993) find similar figures for a sample of 32 major quoted German firms. Table 2 also reveals that the dividend per share figure has a coefficient of variation (i.e., defined as the standard deviation of the series over the mean) of 0.75, which is lower than the coefficient of variation of published earnings (1.07) and cash flows (0.95). The variance ratio of dividends over published earnings equals 0.36 ($=9.2^2/15.3^2$) and the one of dividends over cash flows equals approximately 0.03. This provides a rough estimate of the degree of 'dividend smoothing' (see Goergen *et al.* (2004) for more details). Cash flows have a slightly lower coefficient of variation than published earnings but the variance ratio of published earnings over cash flows equals 0.079 providing some evidence of what we can call 'published earnings smoothing'. As these figures per share may be influenced by firm size, we also show the correlation coefficient between firm size, on the one hand, and dividends, published earnings, and cash flows per share, on the other. We observe that cash flows per share are positively correlated with firm size (coefficient of 21.1 per cent). The correlation coefficients between size, and dividends per share and published earnings are smaller, but are also positively related (8.3 and 14.7 per cent, respectively).

An important stylized fact on German dividends is the high incidence of unchanged dividends every year. As Table 3 reports, almost 51 per cent of the firm-year observations in our sample correspond to cases of maintained dividends. The frequency distribution of dividend changes during 1984-93 looks normal with the average firm changing its dividends per share every two years.

[INSERT TABLE 2 ABOUT HERE]

Table 3 shows that approximately 11 per cent of the firm-years correspond to cases where there are zero dividend payouts in at least two consecutive years. The table also reveals that in 21 per cent of observations (i.e., 203/955), the zero dividend payout is maintained. The proportion of dividend cuts (including omissions) is approximately 16 per cent of the total sample. Approximately 30 per cent of the dividend cuts are dividend omissions, suggesting that in German firms dividend policy is not very rigid. Only five firms do not pay any dividends throughout the whole sample period, whereas 116 firms always pay a strictly positive dividend (not reported in the table)

[INSERT TABLE 3 ABOUT HERE]

In Table 4 we show the characteristics of the distribution of changes in the dividends per share. We observe that the mean increase and cut (excluding dividend initiations and omissions, respectively) are almost identical in absolute value (31 per cent). Half of the dividend cuts amount to 25 per cent or more, whereas the median of increases is lower, at 15 per cent. To summarize, we observe: (i) a high frequency of changes in dividends per share; (ii) a frequent occurrence of dividend omissions and zero dividend payout policies; (iii) some evidence of dividend smoothing; and (iv) the median of dividend cuts is higher than the median of dividend increases.

[INSERT TABLE 4 ABOUT HERE]

5. Estimation and results

Our basic, empirically testable, model is based on the discussion in Section 2:

$$D_{it} = \alpha D_{i,t-1} + \beta \Pi_{it} + YEAR_t + \eta_i + V_{it} \tag{16}$$

where D_{it}, $D_{i,t-1}$ are the dividend per share at time t and t-1, respectively, for firm i; Π_{it} is earnings or cash flow per share at time t for firm i; $YEAR_t$ are time dummies that control for the impact of time on the dividend behaviour of all sample firms; η_i is a firm-specific effect to allow for unobserved influences on the dividend behaviour of each firm and is assumed to remain constant over time. There are several possible sources of these unobserved influences. For instance, this firm-effect can be viewed as a firm's component of the 'normal' signalling constraint which quoted firms may have to satisfy; $V_{it.}$ is a disturbance term.

5.1 Estimation

In this subsection we briefly describe the estimation techniques used (more details can be found on pp.103-106 of Correia *et al.* (2004)). In dynamic panel data models such as (16 with a large cross-section of firms and a small number of time-series observations, there is a potential estimation problem because the earnings variable, Π_{it}, is likely to be correlated across firms with the firm-specific effect, η_i. In addition, the lagged dependent variable is most likely to be correlated with these firm-specific effects. Thus, if we estimate (16) using OLS, the estimators are inconsistent and biased because cov($D_{i,t-1}$,η_i) ≠ 0 and cov(Π_{it},η_i) ≠ 0 (Hsiao 1986). A Within-Groups estimator (WG), i.e. OLS on the equation with each observation expressed as the deviation from the time mean, will eliminate the firm-specific effect. However, the estimators will still be inconsistent and biased since cov($D_{i,t-1}$,$V_{i.}$) ≠ 0, where $V_{i.}$ is the deviation from the time mean of the disturbance term V_{it} (Nickell 1981).

To obtain consistent estimators, the model is first-differenced to eliminate the fixed-effect, η_i:

$$D_{it} - D_{i,t-1} = \alpha\ (D_{i,t-1} - D_{i,t-2}) + \beta\ (\Pi_{it} - \Pi_{i,t-1}) + (YEAR_t - YEAR_{t-1}) \\ + (\eta_i - \eta_i) + (V_{it} - V_{i,t-1}) \qquad (17)$$

We then use an instrumental variable approach (Anderson and Hsiao 1981) to estimate (17) as suggested by Arellano and Bond (1991).

Provided there is no serial correlation in the disturbance V_{it}, we can use all lagged values of the dependent variable, i.e., $D_{i,t-2}$, $D_{i,t-3}$, ...$D_{i,1}$ as valid instruments in the first-differenced equation. Similarly, allowing for a possible correlation between Π_{it} and V_{it}, only lagged values dated t-2 and earlier will be used as instruments (Arellano and Bond 1991). In other words, we allow for the endogeneity of the regressors as it is likely that shocks affecting dividend choices may also affect measured earnings and cash flows. Arellano and Bond (1991) develop a Generalized Method of Moments technique in-first-differences to obtain such an estimator.

A further refinement is developed by Arellano and Bover (1995) and Blundell and Bond (1998). Their Monte Carlo analysis shows that in dynamic panel data models where the autoregressive parameter (i.e. α in (16)) is moderately large and the number of time series observations is moderately small, the GMM-first-differences-IV estimator is poorly behaved.[12] In this case, lagged levels of the series provide weak instruments for the first-differenced equation. The authors propose a linear GMM estimator in a system of first-differenced and levels equations that offers significant efficiency gains in situations where the GMM-first-differences performs poorly. The resulting linear estimator uses lagged

[12] Both one step and two step versions of GMM first-difference showed a downward finite sample bias.

differences of the series as instruments for the equations in levels, in addition to lagged levels of the series as instruments for equations in first differences. Specifically, it uses

$(D_{i,t-1} - D_{i,t-2})$ and $(\Pi_{i,t-1} - \Pi_{i,t-2})$ as additional instruments in the levels equations (16), under the assumption that these differences are uncorrelated with the firm-specific effect, η_i, even though the levels of the series are correlated with η_i. We call this technique GMM-in-systems.

We proceed as follows. We estimate the basic model, and other variations so to include other lag structures. We report the main results relating to the models explained in Section 2, but also estimate a model based on (9), showing that the coefficient of $D_{i,t-2}$ is neither individually nor jointly statistically significant. For all these specifications, we report the results of each of the four estimation techniques described above: OLS in levels, Within-Groups (WG), GMM-in-first-differences (GMM(DIF)) and GMM-in-systems (GMM(SYS)).[13] This procedure shows us how much the size of the speed of adjustment coefficient (i.e., $1-\alpha$) and the one of the implicit target payout ratio (i.e., $\beta/(1-\alpha)$) varies across the different estimation techniques. In addition, it will also be useful to compare our results with those of previous studies which have mainly used the basic OLS-estimation (see pp.95-96 of Correia da Silva *et al*. (2004) for a discussion of alternative estimation techniques).

5.2 Results

We discuss three sets of results: (i) those corresponding to the published earnings model; (ii) those obtained from the cash flow model; and (iii) those derived from a model which includes earnings and cash flows simultaneously.

The parameter estimates obtained from the published earnings model (equation 17) are reported in Table 5. The coefficient on the lagged dividends, α, varies from 0.42, obtained in the WG estimation, to 0.79, when OLS in levels is used. Thus, the speed of adjustment $(1-\alpha)$ lies within a broad a range, namely [0.21, 0.58]. Clearly, a speed of adjustment coefficient of a magnitude of 0.58 makes less economic sense than a coefficient of 0.25 (from GMM(SYS)) because, on average, 50 per cent of our sample firms do not change their dividends and, when

[13] Our estimation procedure is implemented using the Dynamic Panel Data (DPD) programme (Arellano and Bond 1988) which operates under Gauss.

they change it, the average percentage increases and decreases are modest (see Tables 3 and 4). This suggests that some estimation techniques yield incorrect results which may be the consequence of biases introduced by unobserved influences on the dividend behaviour of individual firms. Table 5 also shows that the GMM(DIF) and GMM(SYS) estimation procedures yield realistic speed of adjustment estimates, while the GMM(DIF)-estimates may be biased downward compared to the GMM(SYS)-estimates (for the econometric arguments above). The Sargan test on the validity of the instrument set consistently rejects instruments dated *t-2*, possibly due to the fact that the measurement errors are serially uncorrelated.

[INSERT TABLE 5 ABOUT HERE]

Another useful statistic is the implicit target payout ratio ($\beta/(1-\alpha)$), which can be calculated from Table 5. The target payout ratio varies from 15 per cent (specification (d)) to 41 per cent (specification (a)) and is significantly lower than the observed payout ratio which amounts to 86 per cent[14]. This is true irrespective of the technique used to obtain the estimators. In other terms, biases due to fixed-effects cannot account for the discrepancy between implicit and observed dividend payout ratios. Using GMM(SYS), which econometrically ought to give a parameter estimate closer to the true observed value, one obtains an implicit payout ratio of 28 per cent (specification (g)) and 25 per cent (specification (h)). Thus, it seems that for German firms the dividend decisions are not based on long term target dividend payout ratios.

How do our estimates of the speed of adjustment and the implicit dividend payout ratio perform in comparison to the dividend literature? In previous studies, the estimated speed of adjustment is usually substantially lower than the observed one. For instance, Behm and Zimmermann (1993) test the partial adjustment model for a sample of 32 major German quoted firms during 1962 and 1988. Using an OLS regression on pooled data, the authors find that a specification based on current earnings only has a speed of adjustment of 0.26. Including lagged earnings into the model as well reduces the speed of adjustment coefficient to 0.13. The implicit target payout ratio of 48 per cent in the Behm and Zimmerman study is also lower than the observed ratio of 58 per cent (both figures are on a net basis). For US studies, the estimated average speed of adjustment is also lower than the observed one. For example, the one estimated by Lintner was approximately 30 per cent with a target payout

[14] Table 2 shows that the target payout ratio is 86%; dividends per share are DM 12.3 and earnings per share amounts to DM 14.3.

ratio of 50 per cent of earnings. Lintner's implicit target payout ratio seems to be substantially higher than ours in specification (h). Fama and Babiak (1968) find that a specification, in which the constant term is suppressed and the level of earnings for t-1 is added, provides the best prediction of dividends. Specification (h) includes such a lagged earnings variable but the coefficient is only statistically significant at the 15 per cent level. Note also that Fama and Babiak (1968) find an average speed of adjustment of approximately 0.37, slightly higher than Lintner's.

To summarize, the estimations of the published earnings model for German firms suggest that dividend decisions are not based on long term target payouts, as originally hypothesized by Lintner (1956). This view is supported by implicit payout ratios that deviate substantially from observed payout ratios. An alternative explanation is that target payout ratios are expressed in another profitability measure, for example, cash flows. This would be consistent with the fact that the published earnings figure is likely to be conservative as German firms withhold part of their earnings to build up (legal) reserves. Moreover, it would also be consistent with the hypothesis that firms adjust slowly to cash flows rather than earnings. We investigate this alternative view by re-estimating our model using a cash flow basis.

Table 6 shows that a cash flow model yields parameter estimates which are much closer to reality. Specifications (g) and (h) based on the GMM(SYS) estimation technique give a speed of adjustment of 0.33 and 0.26, respectively, similar to the speed of adjustment obtained in the published earnings model. Unlike the earnings model, the cash flow model gives a more realistic (implicit) target payout ratio. This target payout is 19.6 per cent (specification (g)), which is comparable to the mean (or observed) payout ratio of 21.4 per cent.[15] Notice also, that the coefficient on the lagged cash flows variable is now statistically significant (at the 7 per cent level).

[INSERT TABLE 6 ABOUT HERE]

When inspecting the results obtained by simultaneously including published earnings and cash flows (see Table 7), we find that the explanatory power of the cash flow variables disappears, but that the one of published earnings remains. This result is true irrespective of

[15] In Table 2, the dividends per share are DM 12.3 and the cash flow per share amounts to DM 57.6, giving a cash flow payout ratio of 21.4 per cent.

the estimation technique. Therefore, although the cash flow model seems economically more meaningful (see Section 3) and is better at explaining the dividend policy of German firms, it is puzzling that earnings dominate in the combined model. One possible reason for this may be published earnings smoothing (relative to cash flow) as well as dividend smoothing. Consequently, the true correlation between dividends and cash flows that are not smoothed may be higher than that between dividends and smoothed earnings. We further investigate this issue by regressing current published earnings on lagged published earnings using GMM(SYS). We find a coefficient of persistence (i.e., the autoregressive parameter) of 0.682. We then replicate this experiment for cash flows and find a coefficient of 0.321. This suggests more persistence in published earnings than in cash flows, consistent with our descriptive statistics.

Regarding the speed of adjustment of dividends towards the long term target payout ratio, Germany is somewhat in between two extremes. On the one hand, companies from Anglo-American countries only slowly adjust their dividend policy. For instance, the partial adjustment model by Short *et al.* (2002) shows that UK firms have a long term target payout ratio, which is positively correlated to institutional ownership and negatively to managerial ownership. In contrast, 'emerging markets firms often have a target payout ratio but they are generally less concerned with volatility in dividends over time and, consequently, dividend smoothing over time is less important' (Glen *et al.* 1995: 24). For instance, Adaoglu (2000) shows that the companies listed on the Istanbul Stock Exchange continue to follow unstable dividend policies even after the regulation that required that half of the earnings had to be distributed as cash dividends was abandoned.

[INSERT TABLE 7 ABOUT HERE]

5.3 Alternative Specifications

In order to verify the robustness of the above results, we first consider the impact of differences in dividend practice by industry. We estimate the earnings and cash flow models including 9 industry dummies, but the Wald test of the joint significance of these industries is rejected. Moreover, the coefficients of all the other explanatory variables (cash flows, published earnings or lagged dividends) remain nearly unchanged.

To control for inflation, we deflate all variables by the Consumer Price Index as reported in the monthly bulletin of the *Deutsche Bundesbank.* We compute dividends, published earnings and cash flows at constant prices of 1985 and re-estimate the models of Section 4.2. We conclude that the results do not alter substantially by correcting for inflation.[16] An inspection of the dividend per share time series in real and nominal terms shows that almost all firms change the real dividend per share, as opposed to the nominal dividend which is characterized by a higher discreteness. However, in terms of cross-sectional variation there is not much further information added to the model by estimating it at constant prices. We conclude therefore that there is no strong case for using real instead of nominal dividend and earnings figures in the estimations.

Next, we scale our variables in line with the suggestion by Bond *et al.* (1996) who argue that the presence of firms with very different sizes may be a source of heteroskedasticity in the point estimates. There are several possible variables one can employ to scale dividends and earnings, e.g. total assets, sales, and market capitalization. We use market capitalization at the beginning of the sample period and the basic empirically testable equation (16) becomes:

$$\frac{TD_{it}}{MVE_{i0}} = \alpha\left(\frac{TD_{i,t-1}}{MVE_{i0}}\right) + \beta\left(\frac{T\Pi_{it}}{MVE_{i0}}\right) + YEAR_t + \eta_i + V_{it} \qquad (18)$$

where *TD* stands for total dividends and $T\Pi$ is total published earnings or cash flows. Table 8 reports a summary of the results for the scaled model (18) and its variations including the use of lagged earnings and cash flows. The main observation from this table is that the patterns and the point estimates do not differ significantly from the non-scaled models. We still obtain a cash flow model that produces an implicit payout ratio that is close to the observed ratio, a published earnings model that yields implicit parameters that differ substantially from the observed figures and a high autoregressive parameter. Finally, a model with published earnings and cash flows simultaneously shows a similar pattern to the non-scaled model: cash flows are no longer statistically significant determinants of dividends. The two GMM techniques yield consistent estimators in the scaled model.

[INSERT TABLE 8 ABOUT HERE]

[16] For example, the GMM(SYS) point estimates for model (h) in Table 5 are 0.761 for the coefficient of the lagged dividends, 0.084 for current earnings and -0.028 for the coefficient of lagged earnings, compared to 0.755, 0.095 and -0.034, respectively, obtained for the same model but at current prices. Similarly insignificant differences are found in the estimation of the cash flow model and the model that tests the joint inclusion of cash flows and published earnings.

Bond *et al.* (1996) estimate a specification similar to (a) of Table 8 for a sample of 1,218 UK industrial and commercial quoted companies. They estimate a specification with lagged dividends and current and lagged earnings using a GMM(DIF) technique. They find an autoregressive parameter of the magnitude of 0.69, yielding a speed of adjustment of 0.31. This compares with the parameter of 0.71 that we obtain in specification (a), inducing a speed of adjustment of 0.29. In other words, we find a somewhat lower speed of adjustment for German firms compared to UK data. This result is also similar to the one we find for the non-scaled model (see Section 4.2). Bond *et al.* (1996) also report an implicit cash flow payout ratio of 33.2 per cent compared to ours of 28 per cent (specification (d)).

As the inclusion of the 14 firms that are controlled by other listed German sample firms may create a bias due to double-counting (see Section 3.2), we eliminate these firms and re-estimate specifications (c) and (d) of Table 8 for a sample of 207 firms. We use the same instrument set and find no significant changes in the point estimates. For example, the autoregressive parameter was 0.708 in the cash flow model and 0.734 in the published earnings model. Moreover, current cash flows had a coefficient of 0.081 and lagged values a coefficient of̃ 0.035.

Finally, we discuss the methodological problems related to the fact that we observe (a) a high volatility in the dividend per share time series (compared to that of Anglo-American companies), and (b) a high number of firms which do not change the dividend and have zero dividend payout policies in at least two consecutive years (see Section 3.3). To investigate the influence of these characteristics of the dividend per share series on the size of the autoregressive parameter, we estimate the basic model using the GMM(SYS) technique for a sample that excludes those firms which did not change the dividend per share in at least 75 per cent of the years in our sample period. Accordingly, we eliminate 31 firms, i.e. 14 per cent of our entire sample. Re-estimating the model specifications using this smaller sample yields a larger autoregressive parameter.

6. Conclusions

The extensive literature on dividend policy of Anglo-American companies, which builds on Lintner (1956), shows that most firms set long term target payout ratios. Changes in dividends are triggered by major unexpected and persistent changes in earnings, and dividend changes are avoided if a reversal to the previous dividend level is likely in the short run.

Consequently, not the level of the dividend level but a change in dividends matters as a signal to the market. We examined whether these stylized facts also hold for German firms which operate in a totally different corporate governance regime which is characterized by concentrated control, ownership pyramids, and the representation of banks on the board. To this end, we fit micro models of dividend behaviour to a data set of German industrial and commercial quoted firms comprising more than half of all quoted German companies.

German firms pay out a lower proportion of their cash flows than UK firms. However, on a published profits basis, the pattern is reversed, with German firms showing significantly higher payout ratios. The company law provisions described above partly account for these two conflicting results. In contrast to the Anglo-American evidence, German dividends are more volatile, and dividend omissions and zero dividend payout policies occur more frequently. When we use a partial adjustment model to estimate the implicit target payout ratio and the speed of adjustment of dividends towards a long run target payout ratio based on published earnings, we find that none of our model specifications gives results that are in line with the observed payout and speed of adjustment. Our results do not improve when we abandon the basic estimation techniques such as OLS or Within-Groups for more advanced ones such as GMM-in-differences or GMM-in-systems. The latter two estimation methodologies avoid the biases arising from the estimation of unbalanced dynamic panel data models with a small number of time periods, a large cross-section of firms and unobserved heterogeneity across firms. We find that our model specifications on the relation between dividends, and past dividend policy and published earnings show that the estimated speed of dividend adjustment is consistent with observed dividend patterns. Still, even the GMM estimation techniques yield an implicit target payout ratio based on public earnings of around 25 per cent, which is substantially lower than the observed payout of 86 per cent. Therefore, German firms do not base their dividend decisions on long term target dividend payout ratios based on public earnings.

However, the published earnings figure may not correctly reflect corporate performance as German firms tend to retain significant part of their earnings to build up legal reserves. Given the conservative nature of published earnings figures, the long term payout ratio may be based on cash flows. We do indeed find that the Lintner partial adjustment model yields realistic estimation results when cash flows are substituted for published earnings. Both the speed of dividend adjustment and the implicit payout ratios are close to our observed results, and confirm our prediction that cash flows are economically more meaningful. The implicit target payout ratio of 20 per cent is comparable to the observed one of 21 per cent on a cash flow basis. Hence, we conclude that dividend payout ratios of German firms are based cash flows rather than published earnings. The reason why our partial adjustment models provide better results with cash flows than with published earnings results from a higher degree of smoothing of earnings than of cash flows. This is shown by the autocorrelation of published earnings which is substantially higher than that of cash flows.

Regarding the speed of adjustment of dividends towards the long term target payout ratio, companies from Anglo-American countries only slowly adjust their dividend policy whereas German tend to be more willing to cut the dividend in the wake of a consistent decrease in profitability. The German data suggests that there is a high degree of 'discreteness' in the dividends-per-share time series as opposed to the 'smoothness' (i.e., frequent annual small adjustments in the dividend per share) observed in the US and the UK.

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Table 1 ***Overall Sample Composition***	
Panel A	
Sample Period	1984-1993
Number of Firms	221
Number of Firm-Year Observations	2098
Panel B	
Number of Records per Firm	***Number of Firms***
10	174
9	13
8	15
7	8
6	9
5	2

Table 2

Descriptive Statistics on Dividends, Published Earnings, and Cash Flows

Sample period: 1984-1993. Sample: 221 German industrial and commercial quoted firms. Dividends are gross dividends per share. The cash flows are defined as zero distribution earnings gross of depreciation and changes in provisions. The par value of all shares is standardized to DM 50 (approximately € 25). The coefficient of variation is defined as the standard deviation of the series over its mean.

	Dividends per Share	**Published Earnings per Share**	**Cash Flow per Share**
Mean	12.3	14.3	57.6
Standard Deviation	9.2	15.3	54.6
Coefficient of Variation	0.75	1.07	0.95
Median	12.5	12.2	46.4
Maximum	76.6	684.2	695.7
Minimum	0	-222.9	-198.5
Correlation coefficient of firm size and ...	8.3%	14.7%	21.1%

Table 3

Number of Increases, Decreases and Maintained Dividends

Sample period: 1984 - 1993. Sample: 221 German industrial and commercial quoted firms.

	Nr of Firm-Year Observations	***% of Total***
Dividends *Maintained*	955	50.9%
Thereof, cases of zero dividends in at least two consecutive years	203	10.8%
Dividends *Increased*	615	32.8%
Thereof, Dividend *Initiations*	65	3.5%
Dividend *Cuts*	307	16.4%
thereof, Dividend *Omissions*	107	5.7%
TOTAL	1877	100%

Table 4

Distribution Measures of Percentage Changes

Sample period: 1984 - 1993. Sample: 221 German industrial and commercial quoted firms.
* Excluding dividend initiations. ** Excluding dividend omissions

	Increases	***Cuts***
Mean Percentage of Dividend Increases * / Cuts **	31%	-30.5%
Median Percentage of Dividend Increases * / Cuts **	15.4%	-25%
Standard Deviation of Percentage of Dividend Increases * / Cuts **	63.4%	20.4%
Number of Dividend Increases * / Cuts **	550	200
Nr of Dividend ***Initiations***	65	
Nr of Dividend ***Omissions***		107
Distribution of Size of Dividend Increase * / Cut **		
[0%; 10%] dividend increase / cut	166 (30.2%)	29 (14.5%)
]10%; 25%]	247 (44.9%)	76 (38%)
]25%; 50%]	74 (13.5%)	69 (34.5%)
]50%;75%]	29 (5.3%)	18 (9.0%)
]75%;90%]	7 (1.3%)	8 (4.0%)
]90%;100%]	27 (4.9%)	

Table 5
Dividend Model with Published Earnings

D_{it} is the dependent variable and stands for dividends per share. *PP* are published earnings per share. Time dummies are included in all specifications. m_1 and m_2 are tests for the absence of first-order and second-order serial correlation in the residuals, asymptotically distributed as N(0,1) under the null of no serial correlation. The Sargan statistic is a test of the over-identifying restrictions, asymptotically distributed as $\chi^2(k)$ under the null of valid instruments, with degrees of freedom (k) reported in parentheses. OLS stands for Ordinary Least Squares. WG stands for Within-Group estimation: specifications (c) and (d) have variables expressed as deviations from the time mean. Variables in specifications (e) and (f) are expressed in first-differences. Specifications (g) and (h) are linear systems of first-differenced and levels equations. GMM(DIF) and GMM(SYS) are one-step estimators. Instruments: Specifications (e) and (f): D_{t-3}... D_1 and PP_{t-3} ... PP_1. Specifications (g) and (h) D_{t-3}... D_1 and ΔD_{t-2}, and PP_{t-3} ... PP_1 and ΔPP_{t-2}. Standard-errors, asymptotically robust to heteroskedasticity, are reported in parentheses. ***, ** and * stand for statistical significance at the 1%, 5% and 10% level, respectively.

	OLS in Levels		**WG**		**GMM (DIF)**		**GMM (SYS)**	
Variables	**(a)**	**(b)**	**(c)**	**(d)**	**(e)**	**(f)**	**(g)**	**(h)**
Constant	1.598***	1.630***	-	-	-	-	-	-
	(0.472)	(0.457)						
$D_{i,t-1}$	0.776***	0.786***	0.437***	0.420***	0.584***	0.592***	0.682***	0.745***
	(0.047)	(0.049)	(0.041)	(0.043)	(0.080)	(0.083)	(0.070)	(0.082)
PP_{it}	0.090***	0.093***	0.098***	0.097***	0.077***	0.078***	0.088***	0.095***
	(0.011)	(0.012)	(0.011)	(0.011)	(0.017)	(0.017)	(0.017)	(0.019)
$PP_{i,t-1}$	-	-0.012	-	0.010**	-	-0.003		-0.034
		(0.008)		(0.005)		(0.010)		(0.023)
Time dummies	yes	yes	yes	Yes	yes	yes	yes	yes
m_1	-1.994	-2.248	2.804	3.154	-4.142	-4.108	-4.220	-4.292
m_2	1.638	1.511	3.829	3.822	1.401	1.424	1.475	1.538
Sargan (d.f.)	-	-	-	-	71 (61)	69 (60)	72 (68)	77 (67)
Observations	1876	1876	1655	1655	1655	1655	1655	1655

Table 6

Dividend Model with Cash Flows

D_{it} is the dependent variable and stands for dividends per share. *CF* are cash flows per share. Time dummies are included in all specifications. m_1 and m_2 are tests for the absence of first-order and second-order serial correlation in the residuals, asymptotically distributed as N(0,1) under the null of no serial correlation. The Sargan statistic is a test of the over-identifying restrictions, asymptotically distributed as χ^2(k) under the null of valid instruments, with degrees of freedom (k) reported in parentheses. OLS stands for Ordinary Least Squares. WG stands for Within-Group estimation: specifications (c) and (d) have variables expressed as deviations from time mean. Variables in specifications (e) and (f) are expressed in first-differences. Specifications (g) and (h) are linear systems of first-differenced and levels equations. GMM(DIF) and GMM(SYS) are one-step estimators. Instruments: Specifications (e) and (f): D_{t-3}... D_1 and CF_{t-3} ... CF_1. Specifications (g) and (h) D_{t-3}... D_1, ΔD_{t-2} and CF_{t-3} ... CF_1, ΔCF_{t-2}. Standard-errors, asymptotically robust to heteroskedasticity, are reported in parentheses. ***,** and * stand for statistical significance at the 1%, 5% and 10% level, respectively.

	OLS in Levels		**WG**		**GMM (DIF)**		**GMM (SYS)**	
Variables	**(a)**	**(b)**	**(c)**	**(d)**	**(e)**	**(f)**	**(g)**	**(h)**
Constant	0.987^{**}	1.259^{***}	-	-	-	-	-	-
	(0.414)	(0.391)						
$D_{i,t-1}$	0.827^{***}	0.841^{***}	0.462^{***}	0.465^{***}	0.528^{***}	0.553^{***}	0.674^{***}	0.737^{***}
	(0.049)	(0.046)	(0.043)	(0.023)	(0.096)	(0.090)	(0.082)	(0.081)
CF_{it}	0.026^{***}	0.045^{***}	0.059^{***}	0.060^{***}	0.077^{***}	0.080^{***}	0.064^{***}	0.088^{***}
	(0.005)	(0.008)	(0.008)	(0.004)	(0.019)	(0.019)	(0.015)	(0.018)
$CF_{i,t-1}$	-	-0.026^{***}	-	-0.002	-	-0.017	-	-0.035^{*}
		(0.009)		(0.004)		(0.014)		(0.020)
Time dummies	yes	yes	yes	yes	yes	yes	yes	yes
m_1	-1.382	-1.872	3.469	8.381	-4.514	-4.643	-4.655	-4.899
m_2	1.959	1.437	3.996	6.421	1.130	1.250	1.339	1.431
Sargan (d.f.)	-	-	-	-	63 (61)	64 (60)	76 (68)	70 (67)
Observations	1876	1876	1655	1655	1434	1434	1434	1434

Table 7

Dividend Model with Published Earnings and Cash Flows Simultaneously

D_{it} is the dependent variable in all specifications. It represents dividends per share, *PP* are published earnings per share and *CF* are cash flows per share. Time dummies are included in all specifications. m_1 and m_2 are tests for the absence of first-order and second-order serial correlation in the residuals, asymptotically distributed as N(0,1) under the null of no serial correlation. The Sargan statistic is a test of the over-identifying restrictions, asymptotically distributed as χ^2(k) under the null of valid instruments, with degrees of freedom (k) reported in parentheses. Specification (b) has variables expressed as deviations from time mean. OLS stands for Ordinary Least Squares. WG stands for Within-Group estimation: variables in specification (c) are expressed in first-differences. Specification (d) is a linear system of first-differenced and levels equations. GMM(DIF) and GMM(SYS) are one-step estimators. Instruments: Specifications (c): D_{t-3}... D_1, PP_{t-3}...PP_1 and CF_{t-3}...CF_1. Specification (d) D_{t-3}...D_1, ΔD_{t-2}, PP_{t-3}... PP_1, ΔPP_{t-2} and CF_{t-3}...CF_1, ΔCF_{t-2}. Standard-errors, asymptotically robust to heteroskedasticity, are reported in parentheses. ***, ** and * stand for statistical significance at the 1%, 5% and 10% level, respectively.

	OLS in Levels	**WG**	**GMM (DIF)**	**GMM (SYS)**
Variables	**(a)**	**(b)**	**(c)**	**(d)**
Constant	1.591***	-	-	-
	(0.409)			
$D_{i,t-1}$	0.787***	0.421***	0.522***	0.714***
	(0.050)	(0.044)	(0.086)	(0.086)
PP_{it}	0.103***	0.105***	0.074**	0.069*
	(0.017)	(0.018)	(0.034)	(0.036)
$PP_{i,t-1}$	-0.022	0.008	0.022	-0.007
	(0.015)	(0.012)	(0.030)	(0.038)
CF_{it}	-0.010	-0.008	0.005	0.032
	(0.013)	(0.014)	(0.033)	(0.034)
$CF_{i,t-1}$	0.011	0.001	-0.028	-0.016
	(0.012)	(0.010)	(0.027)	(0.031)
Time dummies	yes	yes	yes	yes
m_1	-2.248	-5.162	-4.755	-4.843
m_2	1.500	1.944	1.476	1.536
Sargan (d.f.)	-	-	97 (86)	116 (100)
Observations	1876	1655	1655	1655

Table 8

Summary Results of the Scaled Estimations

TD_{it} is the dependent variable in all specifications. It represents total dividends. *TPP* are total published earnings and *TCF* are total cash flows. Both variables are scaled by the market capitalization. Time dummies are included in all specifications. m_1 and m_2 are tests for the absence of first-order and second-order serial correlation in the residuals, asymptotically distributed as N(0,1) under the null of no serial correlation. The Sargan statistic is a test of the over-identifying restrictions, asymptotically distributed as $\chi^2(k)$ under the null of valid instruments, with degrees of freedom (k) reported in parentheses. Variables in specifications (a) and (b) are expressed in first-differences. Specifications (c), (d) and (e) are a linear system of first-differenced and levels equations. GMM(DIF) and GMM(SYS) are one-step estimators. Instruments: Specifications (a): $TD_{t-3}...TD_1$, $TPP_{t-3}...TPP_1$; (b) $TD_{t-3}...TD_1$, $TCF_{t-3}...TCF_1$. (c) $TD_{t-3}...TD_1$, ΔTD_{t-2}, $TPP_{t-3}... TPP_1$, ΔTPP_{t-2}; (d) $TD_{t-3}...TD_1$, ΔTD_{t-2} and $TCF_{t-3}...TCF_1$, ΔTCF_{t-2}. Standard-errors, asymptotically robust to heteroskedasticity, are reported in parentheses. ***, ** and * stand for statistical significance at the 1%, 5% and 10% level, respectively.

	GMM(DIF)		GMM(SYS)		
Variables	**(a)**	**(b)**	**(c)**	**(d)**	**(e)**
$TD_{i,t-1}$	0.710***	0.685***	0.722***	0.720***	0.661***
	(0.094)	(0.095)	(0.074)	(0.080)	(0.070)
TPP_{it}	0.069***	-	0.066***	-	0.056
	(0.020)		(0.018)		(0.050)
$TPP_{i,t-1}$	-0.040	-	-0.031	-	-0.010
	(0.031)		(0.027)		(0.044)
TCF_{it}	-	0.080***	-	0.079***	0.012
		(0.017)		(0.018)	(0.045)
$TCF_{i,t-1}$	-	-0.026	-	-0.031	-0.003
		(0.027)		(0.028)	(0.042)
m_1	-5.062	-5.005	-4.832	-4.931	-5.068
m_2	0.676	0.266	0.628	0.346	0.481
Sargan (d.f.)	64.0 (53)	55.5 (53)	77.6 (67)	73.9 (67)	110.8 (100)
Observations	1655	1655	1655	1655	1655