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The Empirical Relationship between Dividends and Earnings in Germany

By Ulrich Behm and Heinz Zimmermann*

The relationship between earnings and dividends of firms has been long debated in the finance literature. A widely used hypothesis was published by Lohn Lintner in 1956 claiming that firms smoothly adjust current dividends to a long term payout target. The empirical implications of this model are tested for a sample of 32 major German firms during 1962 to 1988, and some alternative explanations of the observed dividend-earnings relationship are analyzed.

1. On the relationship between dividends and earnings

There has been a long academic debate whether the dividend decision of a firm affects the shareholder's wealth. The irrelevance proposition by *Miller/Modigliani* 1961 created a long and ongoing controversy how dividend payments affect shareholders wealth.[1] Empirical studies show that unexpected dividend changes significantly affect stock prices on announcement, and dividends seem to be linked to the earnings of the firm. Thus the irrelevance proposition does not seem to be supported by a vast body of empirical studies; instead, managers care about their dividend "policy", and investors as well as financial analysts carefully observe dividends in selecting and pricing stocks.

Firms seem to be very reluctant to adjust dividends to earnings. This phenomenon is known as "dividend smoothing" and may be interpreted that dividends are gradually adjusted in response to permanent earnings changes. There are many possible explanations for dividend smoothing. *First,* a progressive tax system favors stable dividends. *Second,* if shareholders prefer to consume out of their dividends instead of liquidating assets to maintain their consumption level over time (which merely means that they are not indifferent between capital gains and dividends), dividends smoothing is motivated by consumption smoothing. Consumption smoothing is a well known phenomenon in the macroeconomic literature.[2] *Third,* managers

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[1] See *Black* 1976, *Brealey/Myers* 1988, chap 16, or *Miller* 1986 for overviews.

[2] See *Blanchard/Fischer* 1989, chapter 6, or *Bamberg/Spremann* 1981.

may be reluctant to pay out cash flows because they prefer inside to outside financing – which is possibly even in the interest of the existing shareholders.[3] The *fourth* and most popular argument is based on the hypothesis that dividends are only adjusted to the extent that earnings changes are perceived to be permanent (or autocorrelated). There are several possible explanations for this, which are related to the signaling content of dividends (see *Miller/Rock* 1985) or to psychological factors (see *Shefrin/Statman* 1984). *Fifth,* a smooth and stable dividend policy favors dividend (mostly tax) clientèles. Altering the payout ratio requires portfolio-adjustments which are costly for the shareholders.

The first and best known empirical study on the relationship between dividends and earnings in the US is *Lintner* 1956. His analysis is based on a broad survey of 28 industrial firms. He found two stylized facts about dividend behavior. First, firms seem to pay out some long term target proportion of (current) earnings; second, since future earnings are uncertain, they only partially adjust dividends with respect to the level implied by the target proportion if current earnings change. This partial adjustment model of dividends has been the basis for many subsequent empirical studies. Among them, *Fama/Babiak* 1968 found that firms aim to distribute approximately half of their net earnings, and when earnings change, dividends were adjusted only by about one third of the amount implied by the target payout ratio in the first year.

Subsequent studies (e.g. *Marsh/Merton* 1987, *Leithner/Zimmermann* 1990) reveal basically the same features for more recent time periods and different countries. Unlike the classical studies they however investigate the aggregate dividend behavior and not individual firms, and use stock prices as a proxi for permanent earnings. Surprisingly there is not much evidence on the dividend decision of individual European firms, except of folcloristic textbook statements. A study which is most closely related to our paper and empirically addresses the dividend decision of German firms is *Hort* 1984. He investigates various *Lintner* type models for manufacturing firms, both pooled and unpooled, over the period 1961 - 75. Unfortunately, the composition of his sample of firms substantially changes over the time period under investigation, and moreover is not representative for German firms.

The goal of this study is to investigate the dividend behavior of a representative cross-section of German firms. This investigation is important both to understand the economic rationale for the observed dividend decisions, and to infer information from dividend changes. Several models are tested relating dividends to different earnings measures of firms. They are discussed in

[3] See the *Myers-Majluf* 1984 pecking order theory, which is based on information asymmetries.

Section 2. In *Section 3,* the dividend and earnings data are characterized. The main findings (on the Lintner model as fitted to aggregate and disaggregate data) are presented in *Section 4,* and additional results including time series properties of earnings and dividends are discussed in *Section 5*. Conclusions and a comparison with similiar research can be found in *Section 6*.

2. The empirical models as applied to German firms

Dividend payments tend to be more stable than earnings. This observation is supported both by empirical studies and casual evidence from the financial press. What does "stable" dividends mean? *First,* we may simply mean that the standard deviation of the time series of dividends is smaller than the standard deviation of earnings. In the extreme the standard deviation of dividends could even be zero: The dividend is a constant, or growing at a constant rate. *Second,* as suggested by Lintner, it could be assumed that firms try to follow long term dividend targets, expressed as a fraction of current earnings. Current dividends are adjusted slowly to this target ratio. A *third* possible interpretation is that dividends are not based on current, but rather permanent earnings. Transitory earnings changes give no rise to increase or decrease dividends.

The purpose of this paper is to empirically investigate, what "stability of dividends" means for a representative sample of German firms. As cited in the introduction, most empirical studies are related to US firms. Particularly, there is only little evidence on the dividend policy pursued by German firms. Some survey evidence is provided by *Fischer / Jansen / Meyer* 1975; the study summarizes several stylized facts about the dividend policy of German firms as perceived by their managers, but does not provide formal empirical tests of these observations. The main findings are the following: The dividend policy is part of the *long* term (for most firms 5 - 6 years) financial strategy of firms. Firms explicitly try to maintain a *stable* dividend, i.e. managers increase dividends "when they are convinced" that the payout ratio can be maintained in the future. Moreover, in the overwhelming number of cases, dividends are not paid out of companies reserves. If current earnings fail to finance dividend requirements, then dividends are decreased. This asymmetry is fully consistent with the dividend "smoothing" phenomenon described in the introduction. As a final point the authors also notice that the dividend decision is often heavily influenced by large (majority) shareholders (if they exist). This point will be addressed later in this paper.

König 1990, 1991 estimates the *Fama / Babiak* and *Lintner* models for 129 German firms over the time period 1970 - 85. The explanatory power of his regressions is in the area of 60% and 74% on average. The author estimates the "level" version of the models – whereas first differences should be preferred (see below); moreover he does not investigate the dividend behavior on aggregate (for example: industry) levels. He examines company-size, shareholder-structure and leverage effects on dividend policy, and finds statistical evidence for the third of these effects in two out of five equations (see *König* 1990, 40).

2.1 The Lintner model

The Lintner model, proposed and tested originally by *Lintner* 1956, asserts that two factors cause managers to change dividends away from their previous dividend level: First, if current earnings $E(t)$ increase the dividend target as perceived in t, $D^*(t)$, is proportionally increased. This is formalized by

$$D^*(t) = qE(t), \tag{1}$$

where q represents the firm's optimal long-term dividend payout ratio and is assumed to be constant. Second, even if earnings would remain constant, current dividends $D(t)$ may be changed away from their previous level $D(t-1)$ because they are adjusted to a long term dividend denoted by $D^*(t)$, formally

$$D(t) - D(t-1) = g[D^*(t) - D(t-1)], \tag{2}$$

where g is the annual fraction of dividend adjustment, or respectively the inverse of the number of years to adjustment. Inserting equation (1) into (2) gives

$$D(t) - D(t-1) = gqE(t) - gD(t-1). \tag{3}$$

The parameters can be estimated by running a linear regression

$$D(t) - D(t-1) = \alpha + \beta D(t-1) + \gamma E(t) + \varepsilon(t), \tag{4}$$

where we allow for a deterministic dividend trend α. Under the null hypothesis, β is equal to $-g$ and γ is equal to gq. Thus the implicit long term payout ratio q can be calculated by $q = \gamma/g = -\gamma/\beta$. Under the hypothesis that managers are more reluctant to increase rather than to decrease dividends, α should be positive. $\varepsilon(t)$ represents the random component of dividend changes. Alternatively, the regression equation may be stated in dividend levels, i.e.

(5) $$D(t) = D(t-1) - gD(t-1) + gqE(t) = [1-g]D(t-1) + gqE(t).$$

With this specification, the following equation can be estimated:

(6) $$D(t) = \alpha + \beta D(t-1) + \gamma E(t) + \varepsilon(t),$$

where β is now equal to $(1-g)$ instead of $-g$ under the null hypothesis. *Lintner* 1956 and *Hort* 1984 estimate the "level" version of the model, while *Brittain* 1966 and *Fama/Babiak* 1966 estimate the "first difference" version. First differences should be preferred if the non-stationary component of the dividend process is large – although a higher explanatory power can be expected if levels are used. *Lintner* 1956 moreover only presents regression tests for aggregate data and not for individual firms. Aggregation may however create serious problems in identifying the true adjustment process if firms exhibit different adjustment patterns; this is illustrated by *Lippi* 1988. In fact, adjustment patterns may disappear at all in aggregate data series if the individual firms behave sufficiently different. Therefore, aggregate tests should be supplemented by individual firm results. This will be done in this paper.

2.2 A simple permanent earnings version of the Lintner model

Sometimes, an extended partial adjustment dividend model including lagged earnings is estimated. Respective equations can be found in *Fama/Babiak* 1966. While this extension is not explicitly and economically justified by the authors, this can be obtained by a different specification of earnings.[4] The Lintner model states that the dividend target, $D^*(t)$, is proportionally adjusted to *current* earnings $E(t)$. But current earnings are not necessarily the appropriate basis for assessing (a long term) dividend payout target – unless 100% of earnings changes are perceived to be permanent. The hypothesis may be that, because $D^*(t)$ is a *long* term dividend target, the relevant earnings figure also reflect *long* term earnings perspectives.

Consequently, a proxi for permanent earnings, $E^p(t)$, should be used in the respective equation,

(7) $$D^*(t) = qE^p(t).$$

This is easily motivated by the observation that firms tend to increase dividends only to the extent that they are "convinced" that the payout ratio can

[4] The following model is in the spirit of *Miller/Modigliani* 1966 and is restated in *Miller* 1987. An explicit permanent earnings version of dividends (as an analogue to the permanent income hypothesis of consumption) was originally developed by *Fisher* 1957.

be maintained in the future. In economic terms the dividend decision is based on some measure of long-run sustainable or "permanent" earnings. An immediate and simple way would be to define permanent earnings $E^p(t)$ as a weighted average of current and lagged earnings, i.e.

$$E^p(t) = \Theta E(t) + (1 - \Theta) E(t-1), \tag{8}$$

Θ indicates the persistence of earnings. If Θ is equal to zero, earnings changes are fully transitory, i.e. $E^p(t) = E(t-1)$. In this case, there is no economic reason to adjust the long term dividend payout $D^*(t)$ to earnings changes. If however Θ is equal to 1, earnings changes are fully permanent, i.e. $E^p(t) = E(t)$; in this case the long term dividend target $D^*(t)$ is fully adjusted to current earnings changes. Combining equations (7), (6) and (2) implies

$$D(t) - D(t-1) = gq\,\Theta E(t) + gq(1 - \Theta) E(t-1) - g D(t-1) \tag{9}$$

or restated as a regression equation

$$D(t) - D(t-1) = \alpha + \beta D(t-1) + \gamma E(t) + \delta E(t-1) + \varepsilon(t), \tag{10}$$

where, under the null hypothesis, the regression coefficients are given by $\alpha = 0$, $\beta = -g$, $\gamma = gq\,\Theta$, $\delta = gq(1 - \Theta)$. Since the sum of γ and δ is gq, the (implicit) persistence parameter can be estimated by $\Theta = \gamma / (\gamma + \delta)$ and the dividend target ratio can be calculated as $q = -(\gamma + \delta)/\beta$, deviating from the previous coefficient in the numerator by δ, the lagged earnings coefficient. If there are *a priori* restrictions on the size of Θ, this provides an extra test on the validity of the "permanent earnings" approach to the dividend model. For example, the time series characteristics of the earnings series reveal some information about the size of the persistence parameter. At least, estimating equation (10) reveals whether the coefficient has the correct sign.

Of course, equation (9) just adds an extra term to the basic Lintner model. Clearly, depending on the specification of permanent earnings, a more complex lag structure could be imposed. There is however no economic basis to specify the number of relevant lags. According to the principle of parsimony, which is particularly important with short time series, the number of lags should not be unnecessarily high in order to preserve sufficient degrees of freedom.

3. The data

The empirical analysis is based on 32 major German firms from 8 industries; a list of the firms is displayed in the appendix. All firms are publicly traded in Germany. Although the sample is far from exhaustive, it represents 54 % of the capitalization and 67 % of the sales of all firms listed at German stock exchanges (as of December 1989). The study covers the time period from 1962 to 1988. This is the longest possible sample period for which data for *all* the series are historically available. Information on dividends and earnings are taken from the *"Börsenführer"* and, for earlier years on banks, from the *"Aktienführer"*, both published by Hoppenstedt & Co.

All data are calculated on a "per share" basis; a share typically represents a par value of 50 Deutschmark (DM). If the par value changes over time, the statistics are proportionally adjusted to a par value of 50 DM. The specification of earnings and dividends is, of course, crucial for our study. *Dividends* are measured by cash dividends paid out to shareholders. Special dividends are included only if they are related to the firms earnings (e.g. "Boni"). In contrast, "Jubiläumsdividenden" and the like are subtracted from the gross dividend amount.

Following *Haegert/Lehleiter* 1985, *König* 1990, 1991 analyses the relationship between gross dividends and gross profits, both adjusted for taxes, instead of cash dividends and published profits. The use of gross dividends after 1977 can be rationalized by the change of the German corporate tax law in 1977, in the sense that dividends were linked with tax credits. These tax credits are set off against the *domestic* shareholders' income tax liability. As a matter of fact, approximately 30 % of the firms analysed in this paper exhibit a foreign shareholdership owning between 15 % and 50 % of outstanding stocks;[5] for this clientèle gross dividends are not a relevant magnitude. We therefore doubt that gross dividends are more representative than net dividends in the empirical analysis. Nevertheless, the comparative performance of both variables is investigated in a part of the subsequent regressions (Section 4.1) in order to allow for comparisons with recently published results (*König* 1990, 1991).

Two different *earnings* proxies are used: published profits (*PP*, "Jahresüberschuß") and net profits (*NP*, "Nettoergebnis"). To get *per share* amounts, total earnings are divided by the number of outstanding shares. The distinction between the two proxies, *PP* and *NP*, is essential for our study. The Germany company law (Aktienrecht) does not impose very binding valuation rules for assets and liabilities (see *Juesten* 1989). Thus, assets are generally undervalued and liabilities overvalued. Therefore, "published profits" (*PP*) are often below their true value. Specifically, they are *constructed with regard to* the planned dividend payment. This practice is characterized by several authors and textbooks (see e.g. *Hax* 1964, 643; *Franz*

[5] This information is based on the time period 1977 - 1988; see *"Börsenführer"* for information on the shareholder structure of German firms. Since the ownership of German stocks has not to be declared publicly, the exact fraction of foreign shareholdership cannot be evaluated for the firms in our sample.

1974, 104; *Hofmann* 1977, 175; and *Hiege* 1971, 35). As a consequence, because firms want to pay stable dividends, they accordingly try to publish stable profits.

It is obvious that *PP* is somehow related to $D^*(t)$, but not necessarily to true economic earnings. Therefore, the correlation between $D^*(t)$ and $E(t) = PP(t)$ may be spurious. As a consequence, a second earnings measure which is more related to the true earnings is used. "Net profits" (*NP*) is a figure which was developed by the German Financial Analysts Association (Deutsche Vereinigung für Finanzanalyse und Anlageberatung, DVFA) in order to improve financial statement analysis. The figure is calculated for the major German firms since 1962 and has undergone only minor changes during this time period. The main characteristic of the figure is that extraordinary and aperiodic magnitudes are eliminated from current published profits. Thereby, (i) purely transitory components are eliminated from earnings, and (ii) the transfers to positions which have the character of reserves are duly taken into account. Moreover, different valuation schemes for assets are – as far as possible – eliminated. More details on the calculation of *NP* can be found in *DVFA* Heft 18, 18ff. and *Geiger* 1989. Is *PP* or *NP* expected to behave less volatile over time? Since both series are smoothed with respect to earnings, but by different reasons, there is no clear expectation about the difference.

It should be noted that negative *NP* figures are not reported. In these cases, which occurs in just 1 - 3 years in our sample (the cases are marked by an asteriks in the firm list in the appendix) the respective *PP* figure is used. Unfortunately, the *NP* figure is not available for banks. As a substitute, published profits excluding nostro transactions are reported instead. This is of course not equivalent to net profits; banks are therefore excluded from the subsequent analysis when aggregated data are analyzed. The respective results will be based on 27 instead of the total of 32 firms (see Figure 1a/b, Table 1 and the results in Section 4.1).

Table 1

Summary statistics of dividend and earnings series

	Mean (μ)	Standard deviation (σ)	Variation coefficient (σ/μ)
Dividend	7.31	0.86	0.12
Published profits (*PP*)	12.51	3.38	0.27
Net profits (*NP*)	19.23	4.53	0.23

($n = 27$)

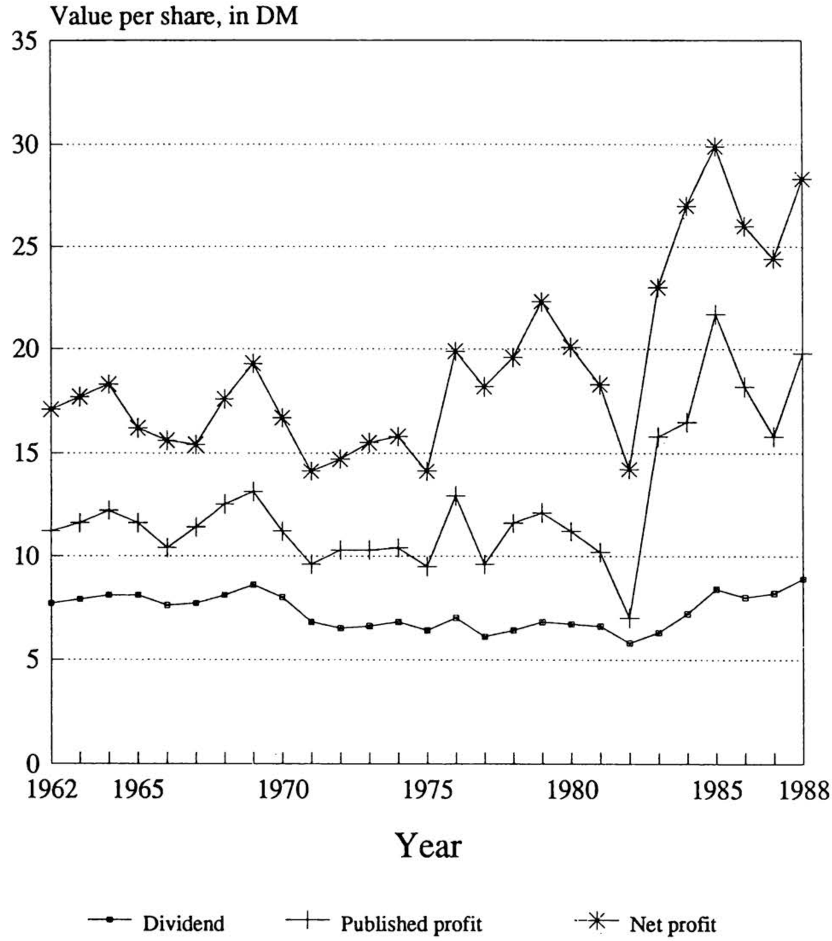

Figure 1a: Dividends and earnings aggregate for 27 firms, 1962 - 88

Aggregate dividend and earnings series are displayed in *Figure 1a,* and some descriptive statistics can be found in *Table 1*. Aggregation is done by summing the total amounts of dividends paid to shareholders, and by adding the respective earnings of all firms in the sample. The figures indicate that dividends per share are much more stable over time than both earnings series. The variance ratio of net profits *NP* to dividends is $4.529^2/0.861^2 = 27.7$. Particularly, the impact of short term earnings declines (1965 - 66, 1980 - 82, 1986 - 87) on dividends is much less than if earnings remain on a stable but low level over a certain time period (1970 - 75). Similarly, significant earnings increases (1966 - 69, 1982 - 85) are only partially

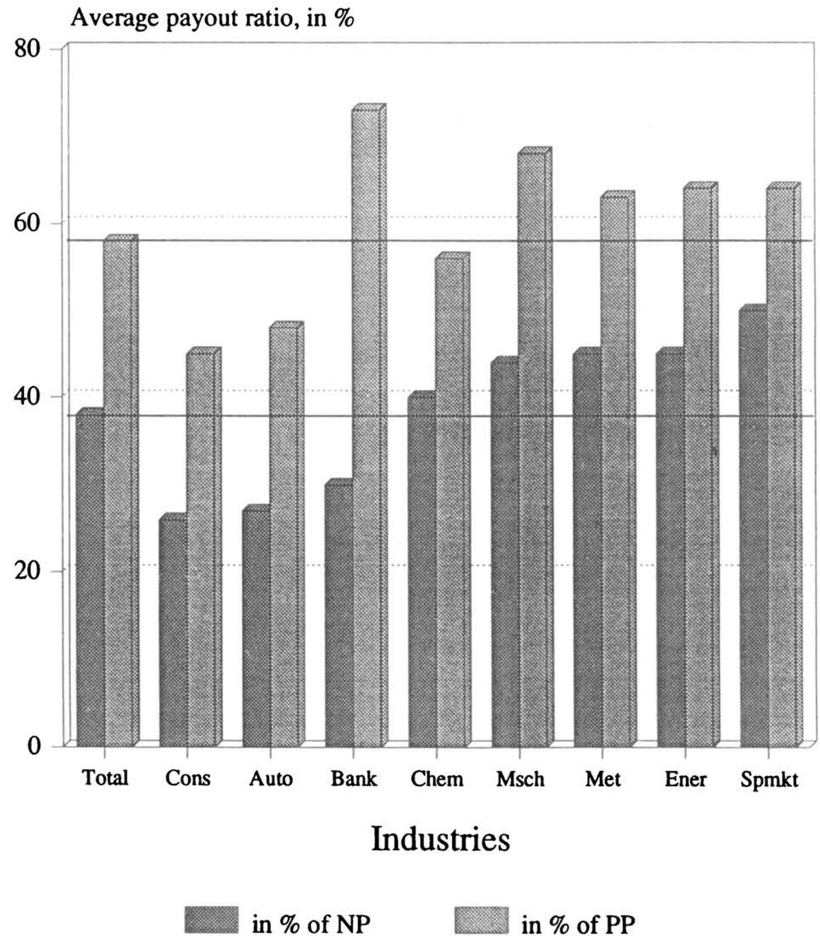

Figure 1b: Dividend payout ratios industry averages, 1962 - 88

translated to higher dividends, and the adjustment is distributed over several years. Therefore dividend smoothing is clearly indicated by a visual inspection of the data series. Firms adjust dividends only partially to earnings changes and are reluctant to decrease dividends. The evidence about the comparative volatility of the two earnings series is ambigous. While the adjustment of aperiodic components in earnings leads to more stable ("smooth") net profits (*NP*) in term of the coefficient of variation, the standard deviation indicates a higher variability for net profits (*NP*).

Figure 1b displays the percentage dividend payout in various industries. The first two bars (which are also marked by two horizontal lines) represent the average across all industries. Apparently the payout ratio substantially varies between industries. Measured in term of net profits (*NP*), it varies between approx. 25 % (construction, automobiles) and 50 % (supermarkets). These findings are more or less consistent with the US experience, where below-average payout ratios are found in the construction sector, and above-average ratios are observed in the energy sector (See *Michel* 1979, *Loderer* 1989 or *Brittain* 1966, 125 ff.). A possible explanation for this phenomenon is the cyclical nature of earnings in the construction industry which increases the average optimal internal financing rate to "hedge" against earnings fluctuations. The energy sector is, of course, relatively stable. Note that the net profit figure of banks cannot be compared to the other industries because of the reason mentioned before. Since published profits (*PP*) are payout-oriented, it is not surprising to notice that the cross-sectional variation of payout ratios is slightly smaller when published profits (*PP*) are used.

4. Empirical Results: the Lintner model

In this section the regression results based on the original Lintner model are presented. Following the literature, the aggregate results are presented first. Although Lintner has initially developed the model to characterize the dividend behavior of individual firms (see *Lintner* 1956, 107 - 108), he unfortunately just reports aggregate results. Nevertheless, the regression results as applied to industries and firms are more relevant for the theory and add more to the understanding of dividend patterns.

4.1 Aggregate results

Estimating equation (4) for aggregate dividends and earnings by ordinary least squares yields the results displayed in *Table 2*.

Equations (4 a) and (4 b) differ with respect to the proxi used for aggregate earnings. In both equations, the variables have the expected sign, and three out of the four coefficients are significant with 95 % confidence. Obviously, the regression results are slightly better if published profits (*PP*) are used compared to net profits (*NP*), both with respect to the significance of the regression parameters and the explanatory power. This is not surprising since, as noted in Section 3, published profits are explicitly related to the planned dividend payments. Therefore, the second equation may be of greater economic interest. The negative value of the first regression coefficient, $b = -g = 0.155$ implies that if the current dividend deviates from the target dividend by 1 Deutschmark, the dividend is adjusted by 0.16 DM in

Table 2

Aggregate results of the Lintner model

Equation	Const (α)	Lagged Dividend (β)	Current Earnings $= PP(t)(\gamma)$	Current Earnings $= NP(t)(\gamma)$	R^2 / R^2 adj.	D-W / D-h
a	0.343	– 0.249	0.121		0.61	1.57
	(0.52)	(– 2.82)	(5.87)		0.58	1.24
4b	– 0.367	– 0.155		0.080	0.50	1.70
	(– 0.46)	(– 1.58)		(4.69)	0.47	0.91
4c	– 0.539	– 0.180	0.189		0.37	1.50
	(– 0.86)	(– 2.06)	(3.71)		0.32	1.46
4d	– 0.905	– 0.347		0.219	0.67	1.98
	(– 1.97)	(– 4.75)		(6.90)	0.64	0.06
4e		– 0.260	0.123		0.61	1.63
		(– 5.90)	(6.23)		0.59	0.94
4f		– 0.196		0.076	0.51	1.63
		(– 4.77)		(5.03)	0.49	0.99

$n = 27$
t-statistics in parantheses

the current period. The adjustment coefficient implied by the first equation is slightly higher.

The implicit target payout ratio $D^*(t)/E(t)$ can be calculated as $q = \gamma / g = -\gamma / \beta = 0.08/0.155 = 0.52$, implying that the dividend target is 52 % of net profits (*NP*) on average. Surprisingly, this value is very close to 0.48 which can be calculated from the first equation. It is surprising because the *actual* (average) payout ratio over the sample period differs significantly depending on whether *NP* or *PP* is used as the earnings proxy (see *Figure 1 a:* the ratios are 38 % and 58 % for *NP* and *PP*, respectively).

If gross dividends are used instead of cash dividends (see equations (4 c) and (4 d) in *Table 2*), the coefficients are statistically significant in all cases, and the constant terms are more negative but still not significant. The explanatory power of the first equation has sharply decreased, whereas it is higher for the second equation. *König* 1990, 33; 1991, 1152, reports similar results for individual firms: on average, the regression coefficients for earnings as well as lagged dividends are statistically significant.

The constant term is not significantly different from zero in all equations. There has been a long debate whether a constant term should be included in the regression equation at all. *Kuh* 1963, 309, proposes to suppress it for statistical reasons. *Brittain* 1966, 19, however argues that a positive constant term can be expected on the aggregate level, since "it allows for the mixture of profitable and unprofitable firms, with the latter tending to maintain dividends in the face of disappointing profits". Since, as documented by *Fischer/Jansen/Meyer* 1975 and summarized in Section 2, German firms do not seem to exhibit this behavior, the non-significance of the constant term may confirm this finding.

It should also be noted that the results are essentially the same if the constant term is omitted (equations (4e) and (4f) in *Table 2*). The numerical values of the regression coefficients are in the same order of magnitude, and the explanatory power of the equations is almost identical. However, the *t*-statistics of the regression coefficients are much higher.[6]

How do these results compare to similar studies? Lintner in his original study reports a target payout ratio of 50% or 60% for the US, depending on how earnings are adjusted. This is very high compared to the German results (38%). This may be rationalized by lower direct costs of outside financing (transactions costs, underwriting fees, ...) in the US capital market; in addition, indirect financing costs positively related to information asymmetries between management and the capital market (*Myers/Majluf* 1984) are less pronounced in the US, due to e.g. more restrictive insider trading rules or to more binding accounting/information disclosure standards.[7] This is consistent with the results reported by *Hort* 1984, where the respective equation implies a target payout ratio of approximately 0.31 (p. 150). The adjustment coefficient reported in the literature is 0.3 (Lintner) and 0.77 (Hort); both coefficients are significantly higher than those estimated above (0.16 and 0.25); it will be shown below that aggregation particularly affects this coefficient, so that this needs no further explanation here.

The explanatory power of the models can be compared only to the *Brittain* 1966 study, both because *Lintner* 1956 and *Hort* 1984 estimate the "level" version of the model (equation 6) and *Fama/Babiak* 1966 as well as *König* 1990, 1991 do not report aggregate results. Brittain reports an R^2-value of 61% which is in the same order as our results. He is however able to considerably increase the explanatory power of the model by using earnings proxies which include corporate depreciation. In order to make our results comparable with the Lintner and Hort study, the level version is also estimated. The R^2-value is 0.843 (with published profits) and 0.800 (with net profits). These values are nearly consistent with the coefficient reported by Lintner

[6] The same observations emerge if the constant term is omitted in the equations with gross dividends.

[7] It should be noted that this was particularly true for the first part of the time period under investigation.

(approx. 0.95), and are clearly higher than those calculated by Hort (0.53 - 0.62).

As mentioned before in 1977 the German corporate tax law was changed in the sense that tax credits on dividend payments became possible. This could have increased the optimal payout ratio q. In order to test for a possible structural break in the regression parameters, a dummy variable, $I(t)$, is imposed on the constant term as well as on the explanatory variables in equation (4), taking 0 before 1977 and 1 afterwards;

$$(4') \qquad D(t) - D(t-1) = [\alpha + \alpha^* I(t)] + [\beta + \beta^* I(t)]\, D(t-1) + [\gamma + \gamma^* I(t)]\, E(t).$$

Under the null hypothesis (no structural break) $\alpha^* = \beta^* = \gamma^* = 0$. The regression results reveal that two of three dummy variables are significant in the first equation (equation (4′a) in *Table 3*). Unfortunately the $PP(t)$-dummy coefficient is negative indicating that the (implied) payout ratio has decreased – which is opposite to the tax hypothesis. However no statistically significant structural break can be identified in the second regression equation (4′b); the sign of the $NP(t)$-dummy coefficient is also negative.[8] We therefore conclude that tax considerations had either no observable, or even the opposite, impact on the long term *aggregate* dividend policy if *cash dividends* are used as the proxy for dividends.

This result is not different if the previous equations are estimated with *gross* dividends instead of net dividends (equations (4′c) and (4′d)). Again, the dummy variable of the constant term is only significant in the first equation. The $PP(t)$-dummy coefficients are negative (as before) whereas the $NP(t)$-dummy coefficient is slightly positive in the second and negative in the first equation, but all are not significant. Therefore, the impact of the tax law change on the long term *aggregate* dividend policy remains ambiguous even if *gross* dividends are regarded to be relevant. Similiar (ambiguous) results are reported by *Bay* 1990, 112 - 114, with aggregate data, and by *Haegert/Lehleiter* 1985, 919, for individual firms. both studies find decreasing payout ratios with respect to cash dividends after 1977. However, the payout ratio based on gross dividends *increases* in the Haegert/Lehleiter study, while no significant change is reported by Bay.

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[8] Splitting the sample period (1962 - 88) in two subperiods (1962 - 76, 1977 - 88) implies a payout target (q) of 1.18 in the first period, and 0.32 in the second if *PP* is used, and the respective figures for *NE* are 0.95 and 0.33. The actual payout ratios are 0.66 and 0.50 (with respect to *PP*), and 0.44 and 0.31 (with respect to *NE*). This indicates that in all cases, the payout ratio has decreased and not increased. Furthermore, the differences in implied rates are much more pronounced than in actual rates.

Table 3

Aggregate results of a test for a structural break

Equ.	Constant (α)	(α^*)	Lagged Dividend (β)	(β^*)	Current Earnings $= PP(t)$ (γ)	(γ^*)	Current Earnings $= NP(t)$ (γ)	(γ^*)	R^2 R^2 adj. D-W
4′a	− 1.39	2.59	− 0.34	− 0.10	0.35	− 0.20			0.82
	(− 1.55)	(2.35)	(− 3.33)	(− 0.70)	(5.68)	(− 3.16)			0.78
									1.53
4′b	− 1.31	1.19	− 0.27	− 0.14			0.20	− 0.06	0.81
	(− 1.36)	(1.02)	(− 2.58)	(0.93)			(4.97)	(− 1.37)	0.76
									1.53
4′c	− 1.39	5.13	− 0.34	− 0.25	0.35	− 0.14			0.81
	(− 0.99)	(3.23)	(− 2.13)	(− 1.35)	(3.62)	(− 1.33)			0.77
									1.75
4′d	− 1.31	3.17	− 0.27	− 0.29			0.20	0.01	0.82
	(− 0.94)	(2.01)	(− 1.79)	(− 1.68)			(3.43)	(0.07)	0.78
									1.64

(α^*), (β^*), (γ^*) = coefficient of dummy variable

$n = 27$
t-statistics in parantheses

4.2 Industry results

Although Lintner based his findings on detailed interviews with individual firms, he does unfortunately not analyze disaggregate data. It is however important to analyze the estimated equations on the industry and firm level because aggregation may moderate (or wash out) possible adjustment patterns. Moreover, as displayed in *Figure 1b*, there are good reasons to assume that the payout policy differs between industries and firms. The estimation results of the Lintner equation (4) are displayed in *Table 4*.[9] They reveal that the findings for the aggregate series apply reasonably well to the individual industries. Although the estimated coefficients as well as the explanatory power significantly differs between the industries, the general result is that the Lintner model gives an accurate picture of the overall dividend behavior. Practically all regression coefficients, β and γ, are highly significant according to the t-values, except β in the first and third regression equation where the t-statistics are only marginally below -2. The β coeffi-

[9] Since net profits (NP) are not published for banks, an alternative earnings measure is used here: profits ex earnings on nostro transactions. This is almost equivalent to interest earnings plus commissions minus overhead costs minus depreciation.

Table 4

Industry results of the Lintner model

Industry	Const (α)	Lagged Dividend (β)	Current Earnings (γ)	R^2 D-W D-h	q g
Constr	0.552	− 0.170	0.028	0.37	0.16
	(0.73)	(− 1.92)	(3.45)	1.80	0.17
				0.56	
Autom	2.264	− 0.534	0.074	0.74	0.14
	(4.05)	(− 6.74)	(7.62)	1.55	0.53
				1.28	
(Bank)	0.757	− 0.192	0.037	0.45	0.19
	(0.86)	(− 1.99)	(4.11)	1.56	0.19
				1.33	
Chem	1.751	− 0.377	0.075	0.50	0.20
	(1.74)	(− 3.06)	(4.72)	1.79	0.38
				0.72	
Masch	1.237	− 0.363	0.084	0.44	0.23
	(1.61)	(− 3.42)	(3.37)	1.97	0.36
				0.09	
Metal	0.794	− 0.356	0.108	0.60	0.30
	(1.38)	(− 3.59)	(5.34)	1.64	0.36
				1.09	
Energ	2.413	− 0.510	0.078	0.40	0.15
	(2.58)	(− 3.58)	(3.00)	1.81	0.51
				0.72	
Supermkts	2.469	− 0.675	0.182	0.47	0.27
	(3.04)	(− 4.54)	(4.10)	2.12	0.68
				− 0.48	

Earnings: net profits (*NP*)
Number of firms: 32
t-statistics in parantheses

cients have all the correct (negative) sign and imply adjustment coefficients ($g = -\beta$) ranging from 17 % / 19 % p.a. (construction / banks) to 68 % p.a. (supermarkets). The "typical" range seems to be 35 % to 55 %. The implied, long term target payout ratio, $q = -(\gamma/\beta)$, varies between 14 % - 16 % (automobiles, energy, construction) and 30 % (metals). This differs substantially from the actual average payout ratios over the sample period which are between 26 % / 27 % (construction, automobiles) and 50 % (supermarkets). This has two possible interpretations. First, the historical sample average is a bad proxi for the true long term target, or the implied estimate based on the regression equation is misleading. It is not possible to discriminate between these two explanations at this stage.

The constant term is positive in all cases, but in only 3 cases significantly different from zero. A positive term indicates that managers are more reluctant to reduce than to increase dividends in response to earnings variations. According to our results, this asymmetry is most pronounced in the automobile, supermarket and energy sector. It does essentially not exist in the construction and banking sector.

The explanatory power of the equation is between 37 % (construction) and 74 % (automobiles). Compared to the R^2-value of the aggregate series (0.50), 5 industries exhibit a lower and 3 a higher coefficient. The overall coefficient of determination (i. e. the simple, unweighted average) is only marginally smaller than 0.50, which sharply contrasts the finding of *Brittain* 1966, 128. He not only reports substantially varying R^2-values in dis-aggregate samples (which corresponds to our finding), but also a *generally* lower explanatory power of the model. This observation could be indeed expected if the underlying hypothesis would have been developed "with aggregates in mind", but "couched in micro language" (see *Grundfeld / Griliches* 1960 for this discussion). One could indeed get this impression by inspecting the original Lintner equation (which was *tested* for aggregates). However this intuition is erroneous because Lintner's hypothesis is not based on "average behavior" (in term of Grunfeld / Griliches), but on interviews with individual firms. If his "micro" theory holds but the behavior is different between firms, then the explanatory power should indeed *increase* by disaggregating the underlying data. It will be interesting to compare the explanatory power of the *individual firm* regression equations (Section 4.3) to those of the aggregate equations.

It should also be noted, that the results are very similiar when published profits (*PP*) are used. An exception are banks, where the t-values of the regression coefficients as well as the explanatory power is approximately doubled. For the other industries, the explanatory power is slightly higher, and the constant term is now significant in the chemical industry. All regression coefficients are significantly different from zero and exhibit the correct sign.[10]

4.3 Individual firm results

The regression equations for all individual firms are not reproduced in this paper. Instead, *Table 5* provides an overview on the size and significance of the regression coefficients β and γ. It is apparent that all but one

[10] The detailed results are available upon request.

regression coefficients have the correct sign and are significant with 95 % confidence with only a few exceptions. One case with a negative γ-coefficient (implying a negative payout ratio) will be excluded from the following analysis; it is caused by a firm in the energy sector which pursues a dividend policy completly independent of the evolution of earnings. The implied target payout ratio (q) for the remaining sample as related to net profits varies between 10 % and 70 % (the major part is distributed between 10 % and 40 %); the adjustment speed (g) is in the range of 10 % and 80 %.

Table 5

Individual firm results of the Lintner model: Summary

Coefficient	negative		positive	
	sign.	insign.	sign.	insign.
$E(t) = PP$				
α		6	14	12
β $[D(t-1)]$	31	1		
γ $[E(t)]$			30	2
$E(t) = NP$				
α		3	13	16
β $[D(t-1)]$	27	5		
γ $[E(t)]$		1	30	1

The constant term is positive in almost all cases, and over 40 % are significant. This observation is consistent with the analysis in Section 4.2 and indicates that specifying a constant term is definitely justified in the analysis of disaggregate data series because it captures an important feature of the dividend policy. It is an interesting example to illustrate how misleading it might be to draw conclusions from aggregate data when a behavioral assumption on individual firms should be tested. The positive constants clearly indicate that managers have a strong preference to increase instead of decreasing dividends – independent how earnings change. It is interesting to notice that the (unweighted) average implied dividend target, $q = -\gamma / \beta$, for NP-equations is again significantly smaller (0.24) than the actual historical mean over the sample period (0.38). The same observation was made in the two previous sections. Despite of the rather encouraging estimation results, it must be questioned whether this implicit measure really provides a good estimate for the (unobservable) dividend target. This topic will be further addressed in the following section.

The average explanatory power of the regressions is 50 %. This is, of course, extremly high given the fact that these are regressions with individual firm data. The results particularly confirm the finding in the previous section that disaggregation does not necessarily decrease the explanatory power of the equations if the theory is based on the micro behavior of the firms. Remember that the R^2-value of the aggregate equation is also 0.50. The explanatory power of our equations is also slightly higher than those reported by *Fama / Babiak* 1966.

It should be noted that the previous results are based on regressions with net profits (*NP*). However, the results with excess profits (*PP*) are not much different, except that the explanatory power of the equations is somewhat higher. The R^2-value is higher in 18 from 32 cases. This is not surprising since *PP* is a payout oriented figure.

A further observation addresses the relationship between the dividend target q and the adjustment speed g. Regressing the second variable on the first yields a regression coefficient of -0.091 if the parameters are derived from the *PP*-regressions, and -0.56 if the parameters are from the *NP*-regressions. Only the second regression coefficient is significantly different from zero, but both are negative. This is consistent with theoretical thoughts advanced e.g. by *Kuh* 1963, 315, predicting an inverse relationship and the results from *König* 1990, 42. The results indicate that firms following a more "active" dividend policy also maintain a lower dividend payout target.

A final point is worth noting. It is shown in Section 4.1 that there is no evidence that the corporate tax reform in Germany in 1977 had a statistically significant impact on the dividend target as inferred by the regression coefficients. However, *Fischer / Jansen / Meyer* 1975 notice that large shareholders systematically co-determine the dividend decision. This raises the question about possible tax clientèles which are related to the shareholder structure of firms. Large shareholders will typically prefer low dividends for tax reasons.[11]

Information on the shareholder structure is available for 3 years within the sample period (1972, 1980 and 1988). 18 firms are selected where the distribution of shares is very stable over this period. The actual (i.e. historical) dividend payout ratio of those 4 firms which are widely owned by the public corresponds to the overall average. According to our hypothesis we should however expect a high payout ratio. Five additional firms have major shareholdings (> 10 % of voting rights) between 40 % and 50 % of their outstanding voting shares. In all these cases the dividend payout is significantly (5 % to 15 %) *above* the overall average – which clearly contradicts the tax hypothesis. The remaining 9 companies are owned by a few shareholders owning 50 % to 80 % of the outstanding capital. Three of them are owned by

[11] This is consistent with an agency cost explanation for the size of dividends; see *Rozeff* 1982.

the government (energy) and pay out high dividends. The remaining firms exhibit a very heterogeneous payout pattern and do not support the hypothesis of a generally low dividend payout ratio. These are, of course, very preliminary results which should be supplemented by the analysis of a more complete, and possibly more representative sample of firms.

5. Further empirical results

In this section the empirical findings of the previous Section are critically re-examined. First, some time series characteristics of earnings are investigated. Second, a simplified permanent-earnings version of the Lintner model, which corresponds to a model estimated by *Fama/Babiak* 1966, is estimated. Third, based on these findings an alternative dividend model is empirically evaluated and compared to the previous models.

5.1 Time series characteristics of earnings

If we accept the view that "permanent" rather than "current" earnings determine dividend payments, then the traditional Lintner equation implicitly assumes that current earnings are identical with permanent earnings, implying that earnings changes are permanent. In this section the persistence of earnings changes is therefore analyzed. If, for example, it turns out that earnings changes are permanent, then current earnings aggregate all relevant information to predict future earnings and are therefore the best proxi for permanent earnings. If, however, earnings changes are partially transitory, then permanent earnings must be characterized by some distributed lag of past earnings.

It must be noted, however, that the current literature on stationarity tests makes it very difficult to discriminate between (trend) stationary and nonstationary series with a unit root (e.g. a random walk); particularly, stationarity tests cannot be based on traditional t-statistics of the estimated autocorrelation coefficients.[12] *Cochrane* 1991 even demonstrates that finite samples never provide test statistics which are powerful enough to test a unit root against a stationary alternative which is arbitrarily close to the unit root. Therefore, the purpose of this section is not to investigate whether the time series of earnings are *stationary or not* in a strict statistical sense, but to examine whether transitory or permanent components *dominate* the volatility of the series under investigation. Therefore simple autocorrelation coefficients are sufficient for this purpose.

[12] *Perron* 1988 provides an overview on modified tests for alternative specifications of the underlying process, as well as a test strategy for stationarity.

Equation (9) imposes a simple specification of permanent earnings which allows for autocorrelation ("persistence") over one period. Of course, a more complex lag structure could be more adequate. This will however not be investigated in this paper. The main purpose of this section is to "check" whether there is some *empirical* justification for a generalized version (10) of the Lintner model. Moreover the autocorrelation coefficient will provide a benchmark against which the persistence parameter Θ, which will be estimated out of equation (10), can be compared.

Table 6 displays autocorrelation and partial autocorrelation coefficients for the *aggregate* series up to 8 lags. The aggregate series reveal that a simple AR(1) model is an adequate description of the levels of earnings and dividends (the partial autocorrelation coefficient is only significant at the first

Table 6

Autocorrelation and partial autocorrelation coefficients of annual aggregate earnings and dividends, levels and first differences

Panel A: Autocorrelation coefficients

Lag	$PP(t)$	$PP(t)-PP(t-1)$	$NP(t)$	$NP(t)-NP(t-1)$	$D(t)$	$D(t)$-$D(t-1)$
1	0.586*	−0.286	0.700*	−0.041	0.712*	0.111
2	0.452	0.030	0.481	−0.247	0.438	−0.188
3	0.229	−0.248	0.326	−0.351	0.258	−0.196
4	0.060	−0.067	0.243	0.047	0.136	0.135
5	0.059	0.348	0.175	0.268	0.062	0.265
6	−0.150	−0.224	0.061	−0.139	−0.051	0.034
7	0.008	0.213	0.164	0.179	−0.142	−0.027
8	−0.057	−0.219	0.108	−0.103	−0.268	−0.289

Panel B: Partial autocorrelation coefficients

Lag	$PP(t)$	$PP(t)-PP(t-1)$	$NP(t)$	$NP(t)-NP(t-1)$	$D(t)$	$D(t)$-$D(t-1)$
1	0.586*	−0.286	0.700*	−0.041	0.712*	0.111
2	0.165	−0.057	−0.019	−0.249	−0.140	−0.203
3	−0.139	−0.279	−0.007	−0.399	0.004	−0.157
4	−0.130	−0.263	0.043	−0.113	−0.027	0.149
5	0.127	0.271	−0.013	0.083	−0.007	0.187
6	−0.262	−0.157	−0.127	−0.304	−0.153	−0.001
7	0.262	0.097	0.334	0.273	−0.054	0.093
8	−0.085	0.014	−0.234	−0.033	−0.213	−0.270

* denotes significance at 95 %

lag). The same observation also emerges for almost all *individual* firm series. The results clearly indicate that the autocorrelation coefficients are far below unity. The overall (unweighted) mean of all individual firms for the *PP* series is 0.59, the mean for the *NP* series is 0.70. The respective coefficients for the aggregate series are the same. This means that a substantial part of earnings changes is transitory. This finding is consistent with American studies (see e.g. *Perron* 1988). This indicates that transitory changes in earnings (and dividends) are not negligible, so that a more general characterization than $E^p(t) = E(t)$ for permanent earnings is warranted.

As a side observation, it is interesting to notice that dividend changes exhibit a higher first order autocorrelation coefficient than earnings across many firms. The average coefficient of the *individual* series is 0.80 (*D*) compared to 0.59 (*PP*) and 0.70 (*NP*). The same observation does not emerge from the *aggregate* series where first order autocorrelation of dividends (0.71) is in the same order of magnitude than for net profits (0.70). The first observation is fully consistent with the presumption that firms are much more reluctant to change dividends than earnings.

5.2 Tests of the simple permanent earnings version of the Lintner model

The findings of the previous section strongly suggest to specify an earnings model where only a part of earnings changes is permanent, and that permanent earnings in t can be approximated by $E^p(t) = \Theta E(t) + (1 - \Theta) E(t-1)$. The time series characteristics indicate that Θ is typically in the range of 0.6 to 0.8. Estimating the dividend model with this earnings specification (equation (10)) provides the following results for the aggregate series:

Table 7

Aggregate results of a permanent earnings version of the Lintner model

Equ.	Const. (α)	Lagged Dividend (β)	Current Earnings (γ) = $PP(t)$	bzw.	$NP(t)$	Lagged Earnings (δ) = $PP(t)$	bzw.	$NP(t)$	R^2 adj. D-W
9a	−0.103	−0.131	0.162			−0.077			0.65
	(−0.16)	(−1.33)	(6.34)			(−2.35)			1.84
9b	−1.084	0.018			0.156			−0.107	0.68
	(−1.69)	(0.21)			(6.68)			(−4.10)	1.86

$n = 26$
t-statistics in parantheses

The results are clearly disappointing. First, the β parameter which accounts for the adjustment towards the long term dividend target is no longer significant; in the second equation it even has the wrong sign. In both equations the current as well as the lagged earnings are highly significant, but the lagged variable (δ) has the wrong sign! Of course this implies that the persistence parameter Θ which is defined as $\Theta = \gamma / (\gamma + \delta)$ exceeds 1 which has no economic meaning.

These results are not much more encouraging for individual firms (see *Table 8* for a summary). While the dividend coefficient (β) has the correct (negative) sign throughout the equations, only 22 coefficients are significant compared to 27 (31) in the original Lintner model. However, the lagged earnings coefficient (δ) remains negative in two thirds of the equations. Among the 22 (20) negative values, 9 (6) are even statistically significant. Although the results are not reported in detail, similar results can be found by *Fama/Babiak* 1966, 1140, Panel B, but the authors do not comment it. The average regression coefficient of lagged earnings from 392 firms is very small (0.043), and the cross-sectional distribution indicates that at least 25 % of the coefficients are negative.

Table 8

Individual firm results of an extended Lintner model: Summary

Coefficient	negative		positive	
	sign.	insign.	sign.	insign.
$E(t) = PP$				
α		6	14	12
β $[D(t-1)]$	22	10		
γ $[E(t)]$			30	2
δ $[E(t-1)]$	6	14	1	11
$E(t) = NP$				
α		5	13	14
β $[D(T-1)]$	22	10		
γ $[E(t)]$			28	4
δ $[E(t-1)]$	9	13		10

This section suggests (as well as some results of Fama/Babiak) that a simple extension of the original Lintner model produces unsatisfactory results. It could be argued that the Lintner model is a misspecification of the dividend-earnings relationship, and that the implied long term dividend adjustment is spurious. There are three possible explanations for this. First, the specification of permanent earnings may be unwarranted. However, the simple lag structure provides an often used and empirically valid (see Section 5.1) extension of the basic model. Second, dividends may be unrelated to permanent earnings. Instead, dividends may be based (as the Lintner model asserts) on current earnings. Third, the dividend decision is not based on long term targets; this will be tested in the next section. It should be noted that this argument is independent of the second; it could well be the case that dividends are based on permanent earnings (i.e. dividends are set at a constant fraction of permanent earnings), but they are not adjusted to a long term target. Of course, all three factors may be relevant simultaneously. The last section of this paper tries to show that the same statistical performance as for the previously investigated models can be observed with extremly simple models. This casts serious doubt about the behavioral implications which can be derived from the previously tested dividend models.

5.3 A simplified model of dividend behavior

The results in the previous section show that simultaneously including lagged dividends and lagged earnings as explanatory variables deteriorates the empirical results and their interpretation. In this section, we maintain the hypothesis that permanent rather than current earnings determine the dividend payout, and that the simple one lag adjustment model of permanent earnings is correct. However, we drop the hypothesis that dividends are adjusted with respect to a long term dividend target. We specifically assume that dividends are simply proportional to permanent earnings,

$$D(t) = a + b\,E^p(t), \tag{11}$$

where b is the proportionality factor. If permanent earnings are again defined as $E^p(t) = \Theta\,E(t) + (1-\Theta)\,E(t-1)$, this implies

$$D(t) - D(t-1) = b\,\Theta\,[E(t) - E(t-1)] + b\,(1-\Theta)\,[E(t-1) - E(t-2)], \tag{12}$$

which can be estimated by regressing dividend changes on present and past earnings changes.

$$D(t) - D(t-1) = \alpha + \beta\,[E(t) - E(t-1)] + \gamma\,[E(t-1) - E(t-2)] + \varepsilon(t), \tag{13}$$

with $\beta = b\,\Theta$ and $\gamma = b\,(1-\Theta)$. The results with aggregate data are displayed in *Table 9*. Under the null hypothesis that $\beta = b\,\Theta$ and $\gamma = b\,(1-\Theta)$ the persistence parameter of earnings is given by $\Theta = \beta/(\beta+\gamma)$. The parameter derived from the first equation is 0.705, the respective coefficient derived from the second equation is 0.781. Compared to section 5.2, these figures are much closer to the autocorrelation coefficients calculated in Section 5.1 (0.59 for *PP*, 0.70 for *NP*). The explanatory power of the equations is even slightly superior to the original Lintner model (Section 4.1)!

Table 9

Aggregate results of a simplified model of dividend behavior

Equation	Constant (α)	$E(t)-E(t-1)$ (β) = $PP(t)$	bzw.	$NP(t)$	$E(t-1)-E(t-2)$ (γ) = $PP(t)$	bzw.	$NP(t)$	R^2 / R^2 adj. / *D-W*
13a	− 0.028	0.165			0.069			0.63
	(− 0.39)	(6.11)			(2.46)			0.60
								1.77
13b	− 0.032			0.139			0.039	0.63
	(− 0.44)			(5.91)			(1.62)	0.59
								1.56

$n = 25$
t-statistics in parantheses

The equations fitted to individual firm data are equally supportive for the model. Unlike in the "permanent earnings version" of the Lintner model (Section 5.2), practically all regression coefficients have the correct sign. β is positive in all cases (3 are *not* significantly different from zero); γ is negative in 6 cases, 26 are positive out of which 8 are significant. Among the negative coefficients, all except one are numerically very small, and only one coefficient is statistically significant (negative). These results clearly indicate that estimation results significantly improve if the lagged dividend is dropped from the equation (given that lagged earnings are included). An immediate interpretation is that much of the lagged dividend information is captured or explained by lagged *earnings,* and has therefore nothing to do with a possible adjustment to a long term dividend target as imposed by the Lintner model. This observation is also supported by a very "naïve" dividend model which just assumes that a constant part of current earnings is paid out as dividends. In first differences this implies

$$D(t) - D(t-1) = \alpha + \beta[E(t) - E(t-1)] + \varepsilon(t). \tag{14}$$

The R^2-value of this regression is 51% (with *PP*) or 56% (with *NP*). The R^2-coefficients of the individual firm regressions are generally slightly lower. It is worth noting that these regressions exhibit an explanatory power similar to the original Lintner model. This is just to illustrate that the high explanatory power of the Lintner model can be easily obtained by very simple behavioral assumptions.

6. Conclusions and final comments

This paper analyzes the empirical relationship between dividends and earnings for a sample of 32 German firms. Two stylized facts are typically reported in the empirical literature on dividend behavior over time: that firms smooth dividend payments with respect to earnings, and that they adjust dividends to long term targets. These hypotheses are formalized by the Lintner model or its variants. This paper reveals rather promising results for the Lintner model, both with aggregate and individual firm data. The regression coefficients and explanatory power of the estimated equations are broadly consistent with those found in other studies, and are particularly supportive for the equations fitted to individual firm data. However, slight modifications of the model, specifically a more general proxy for permanent earnings, reveal puzzling results. They support the view that dividend decisions may not be based on a long term target as imposed by the Lintner model. This view is supported by two empirical facts, namely that the long term dividend payout average substantially deviates from the implied target ratios, and that a "naïve"dividend model with lagged earnings exhibits at least the same explanatory power as more sophisticated versions of the dividend behavior. Of course, further studies are necessary to discriminate between the various models.

The interpretation of the findings of this paper is consistent with results reported by *Leithner / Zimmermann* 1990. Their approach takes the perspective that if the maintained hypothesis about the long term and dynamically adjusted relationship between dividends and earnings holds, and if both series contain a unit root (which was found for real dividends and earnings as measured by the firm capitalization) then the relevant test of the Lintner model is a co-integration test. The paper reports rather pessimistic findings about the relationship between dividends and permanent earnings. An ongoing controversy about a number of methodological issues (such as testing stationarity and interpreting co-integrated series) which is far from conclusive moreover makes an interpretation of these findings difficult. This explains the methodological less sophisticated but nevertheless insightful approach of the present study.

Appendix 1: Sample Stocks and Industries

I. Construction	1.	Dyckerhoff Zementwerke AG
	2.	Hochtief AG
	3.	Phillip Holzmann AG
II. Automobiles	4.	Bayerische Motorenwerke AG
	5.	Daimler Benz AG
	6.	Volkswagen AG*
III. Banks	7.	Bayerische Hypo- und Wechselbank AG
	8.	Bayerische Vereinsbank AG
	9.	Commerzbank AG*
	10.	Deutsche Bank AG
	11.	Dresdner Bank AG
IV. Chemical	12.	BASF AG
	13.	Bayer AG
	14.	Hoechst AG
	15.	Schering AG
V. Machinery	16.	Deutsche Babcock AG*
	17.	Klöckner Humboldt Deutz AG*
	18.	Linde AG
	19.	MAN AG*
	20.	Mannesmann AG
VI. Metal	21.	Degussa AG
	22.	Hoesch AG*
	23.	Metallgesellschaft AG*
	24.	Preussag AG*
	25.	Thyssen AG*
VII. Energy	26.	Hamburgische Elektrizitätswerke AG
	27.	Isar-Amperwerke AG
	28.	Rhein.-Westf.-Elektrizitätswerke AG
VIII. Supermarkets	29.	Karstadt AG
	30.	Kaufhof AG
– other	31.	Siemens AG
	32.	Continental AG*

* denotes firms where net profits (*NP*) were not available for a few years (see Section 3).

Summary

The article analyses the relationship between dividends and earnings for 32 major German firms during the time period 1962 to 1988. There is strong evidence that managers try to "smooth" dividends with respect to earnings. The results are however less conclusive about the adjustment of dividends to a long term target payout ratio. While the traditional Lintner model fits the German data well, a simple generalization of the original equation produces unsatisfactory results. A possible explanation may be that the Lintner model is a misspecification of the dividend-earnings relationship, and that the implied long-term dividend adjustments is spurious.

Zusammenfassung

Im vorliegenden Beitrag wird die Beziehung zwischen Dividenden und Unternehmensgewinnen für 32 hochkapitalisierte deutsche Gesellschaften über die Zeitperiode 1962 bis 1988 analysiert. Es besteht eindeutige Evidenz dafür, daß die Unternehmungsleitungen die Dividendenzahlungen hinsichtlich der Gewinnentwicklung „glätten". Andererseits sind die empirischen Ergebnisse weniger eindeutig hinsichtlich der Existenz langfristiger Ausschüttungsziele. Zwar weist das traditionelle Lintner-Modell für die Dividendenpolitik der untersuchten Gesellschaften einen erstaunlich hohen Erklärungsgehalt auf, doch führt bereits eine einfache Erweiterung des Modells zu unbefriedigenderen Ergebnissen. Es wird argumentiert, daß das Lintner-Modell möglicherweise eine Fehlspezifikation des unterstellten Zusammenhangs darstellt, und daß das langfristige Ausschüttungsziel nur scheinbar existiert.

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