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No 52

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by

J W Lomax

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The object of this series of papers is to give a wider circulation to econometric research being undertaken in the Bank and to invite comment upon it; and any comments should be sent to the author at the address given below. The views expressed are those of the author and not necessarily those of the Bank of England.

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ABSTRACT

Movements in industrial and commercial companies' dividends over time have proved difficult to explain, and their recent extremely high level has been a particular puzzle. The dividend-payout ratio (that is dividends as a proportion of cashflow) provides perhaps the best summary statistic of trends in the strength of distributions over time. The payout ratio was high in the 1960s (average of 50.5% from 1963–69), low in the 1970s (average of 23.8%) and moderate in the 1980s (33.7% to 1988). It has, moreover, been unusually volatile over the most recent time span; high in 1980–82, subdued over 1983–85 and subsequently very strong, reaching 71.5% in the third quarter of 1989.

Existing empirical studies have typically sought to explain firms' dividend behaviour in terms of the nature of the tax system and companies' cashflow, while also making allowance for government controls. As regards the tax system, Miller and Modigliani's (1958) irrelevance theorem suggests that this will critically affect shareholders' attitudes to dividend policies; in particular, relative marginal tax rates should very substantially determine whether they prefer to receive income in the form of dividends or capital gains. Cashflow is thought to be important because it is believed that managers have some target payout for dividends in relation to income. At a more fundamental level, this explanation for dividend behaviour stems from the dichotomy between ownership and control in the modern corporate form. The managers of the firm (insiders) typically have better information about its prospects than shareholders (outsiders); however, the latter have a collective interest in receiving news from management in order to improve their portfolio allocation decisions. Information cannot be conveyed directly (for example, specific information on investment plans), since the firm's competitors would also benefit from its availability. Instead the dividend can represent a useful and timely signalling device.

Econometric models formulated along these lines are, however, unable to account for the recent exceptional growth of dividend payments, and this paper considers alternative and additional reasons for observed dividend behaviour. In the first place, as regards tax effects, changes in tax rates were not found to determine dividend policy. By contrast, movements in the incidence of tax exhaustion (that is the extent to which companies have insufficient tax credits against which to offset the advance corporation tax payments associated with dividend payments) were found to exert an influence. Second, current cashflow also does relatively little work in explaining trends in dividend behaviour. One explanation could be that it is a poor indicator of managers' expected profit flow. Accordingly, the recent strength of dividends could be partly attributable to unusual confidence about company prospects. This has been reflected in the record level of the investment-output ratio and, in fact, in the paper it is found that capital expenditure can usefully be included in the dividend equation.

An additional facet to the story is, however, that not only is there a separation of ownership and control, but also that the interests of management and shareholders may not coincide. The paper suggests that this has important consequences for dividend policy, in that distributions tend to rise strongly in periods of hostile takeover activity. At least two lines of causation have been suggested. One is based on the premise that management typically prefer a low payout in order to pursue growth maximising strategies or consume perquisites, while shareholders generally wish for a high payout in order to force management to incur the inspection of the capital markets for each new project undertaken. Hostile takeover activity could partly resolve this conflict, since firms which deviate most extensively from shareholder objectives—and which consequently tend to have lower market values—have a greater likelihood of being acquired. An alternative interpretation of the takeover-dividend relationship, which suggests that merger activity is likely to aggravate rather than reconcile management-shareholder conflicts of interest, stems from signalling theory. In particular, distribution increases could represent a false signal about the future prospects of the firm made to assist management to retain control. The paper sheds little light, however, on which of these explanations is more plausible and this remains an important question for future research.

A model of ICCs' dividend payments

Introduction

This paper attempts to explain recent trends in industrial and commercial companies (ICCs') dividend payments. Initially, various theories of corporate dividend policy are reviewed. Such work suggests that signalling, tax effects and agency costs could play an important role in determining corporate strategy. In the mainstream empirical literature these influences have been picked up by movements in cashflow and tax rates. In addition, periods of dividend control have typically been modelled using dummy variables.

The second part of the paper uses Engle and Yoo's [Engle and Yoo (1989)] three step procedure to estimate empirical dividend equations. The main features of the results are as follows. In the first place, it proves impossible to find an equilibrium role for tax rate effects although the incidence of tax exhaustion is found to determine dividend policy. Second, the co-integration properties of the model are improved if a variable transmitting the effects of hostile bids is considered. Moreover, its ommission results in the dynamic equation exhibiting a poor forecasting performance. Finally, it is suggested that investment expenditure conveys corporate signalling effects more satisfactorily than profits in the short run, although the latter still emerges as a significant explanatory variable in the long run.

Part One: Theoretical Considerations

This section discusses some of the main influences on corporate dividend behaviour these being taxes, information disbursement, bankruptcy costs and controls. These are considered in turn.

Tax

According to Miller and Modigliani's irrelevance theorem [Miller and Modigliani (1958)], shareholders' attitudes to dividend policies will be entirely determined by the tax system and in particular the relative effective rates of income and capital gains tax. In the United Kingdom, these have varied substantially over the past three decades partly in line with the system of corporation tax in place.

Nevertheless, a broad theoretical framework exists for evaluating the degree of discrimination between retentions and distributions imposed by different tax regimes [see King (1977) and Poterba and Summers (1985)]. A useful summary 'tax discrimination' variable (denoted by θ) may be defined as the opportunity cost of retained earnings in terms of post-tax earnings forgone. It represents the additional disposable income which shareholders could receive if one unit of retained earnings were distributed. If cash in the hands of the company and cash in the hand of the shareholder can be interchanged without attracting an additional tax liability (or credit), then there is no discrimination and the value of θ is unity. If θ is less than 1, dividends are taxed more highly than retentions whereas retentions bear the heavier tax burden when θ exceeds 1. Thus defined, θ depends on investors' personal tax rates.

Between 1965 and 1973, a classical system of corporation tax was in place. Companies paid tax on profits and shareholders also paid the full rate of income tax on dividend receipts. In these circumstances, Poterba and Summers (1985) define $\theta = \frac{(1-M)}{(1-Z)}$ where M is the effective marginal rate of tax on dividends and Z is the effective marginal capital gains tax allowing for the reductions afforded by deferred realisation. This system involves the double taxation of dividends and θ takes a relatively low value.

An imputation system of corporation tax was implemented in 1973 and this has existed through until the present day. It gives shareholders credits for tax paid by companies and these can be used to offset their personal tax liability on dividends.

Thus, $\theta = \frac{(1-M)}{(1-S)(1-Z)}$ where S is the imputation rate (currently the standard rate of income tax). The introduction of the imputation rate had the effect of raising θ, thereby giving firms an incentive to pay dividends.

The values of M and Z used to compute θ are typically weighted averages of the marginal tax rates faced by different shareholders. Thus, the value of the tax discrimination variable has varied over time reflecting not only movements in tax rates but also changes in the pattern of share ownership. If one class of investor is in fact the "marginal investor" then the weighted averages are substantially misleading as indicators of the tax rates guiding market prices. Even if this is the case, however, there is still some information in the time series for θ since the tax burden for most classes of investors moved in the same direction in each tax reform.

Using this broad framework, empirical studies by Fane (1975), King (1977), Poterba and Summers (1985) and Mayer and Pashardes (1986) amongst others have found systematic evidence of tax effects in dividend equations. Miles and Chowdhury (1987) using a less restricted formulation provide some additional empirical support. In contrast, *Bank of England Quarterly Bulletin* (1980) finds little evidence that dividends are affected by changes in the tax regime.

Under an imputation system one further aspect of the influence of tax on dividend payments requiring consideration lies in the extent to which companies are "tax exhausted": that is the extent to which they have insufficient tax credits against which to offset their advance corporation tax payments. In such circumstances, distributions impose an additional tax burden on shareholders. Edwards et al (1987) investigated the impact of tax exhaustion on dividend policies, in a pooled cross-section time-series study, and found some evidence of intertemporal, although little cross company impact.

Despite the significance of tax effects in some empirical dividend equations, considerable difficulties remain in attributing observed corporate behaviour to features of the taxation system. As Feldstein and Green (1984) indicate, a segmented equilibrium in which companies specialise should still emerge, since for any aggregate value of θ almost all shareholders will individually prefer either no dividends or no retained earnings. Thus, additional stories have to be invoked in order to provide an adequate explanation of the data.

Agency costs

A further set of explanations for dividend behaviour stem from the dichotomy between ownership and control in the modern corporate form. Typically the interests of management (agents) and shareholders (principals) do not coincide. Easterbrook (1984) and Jensen (1986) suggest that the former typically prefer a low payout in order to pursue growth maximising strategies or consume perquisities, while the latter generally wish for a high payout since this will force the former to incur the inspection of the capital markets for each new project undertaken. Takeover activity could partly resolve the conflict, since those firms which deviate most extensively from shareholder objectives—and which consequently tend to have lower market values—have a greater likelihood of being acquired. This suggests that one means of avoiding takeover is to commit to a high dividend. In terms of explaining trends in distributions over time, innovations in the market for corporate control (such as the recent increased availability of low grade debt finance) are therefore of paramount importance since these are likely to have altered the balance of power between management and shareholders. Equally, the broad trend in takeover activity itself could be associated with movements in dividend payments.

Table 1 provides some informal evidence that contested bids are associated with growth in dividend payments. The defence to all hostile bids over £0.5 billion between 1988 Q3 and 1990 Q1 included a projected substantial rise in distributions.

Table 1: The relationship between dividends and contested bids over £0.5 billion between 1988Q3 and 1990Q1

Target	Bidder	Value of Bid (£mn)	Dividend Resp of Target (% increase o previous year)
Ward White	Boots	890	20
Plessey	GEC/Siemens	1,675	20
DRG	Pembridge Associates	641	30
Consgold	Minorco	2,780	25
BAT	Hoylake	13,420	49
Rowntree	Nestle	2,622	19
Gateway	Isosceles	2,043	12
Pleasurama	Mecca Leisure	725	15
Rank Hovis	Goldman		
McDougall	Fielder Wattie	1,725	25

In addition, King (1977) found some relatively weak evidence of general trends in takeover activity determining dividend behaviour.

A second agency cost explanation of dividend policy lies in the potential conflict between shareholders and debtholders. Jensen and Meckling (1976) suggest that shareholders have an incentive to engage in projects that are too risky and so increase the possibility of bankruptcy. If unsuccessful the limited liability provisions of debt contracts imply that the creditors bear most of the cost. Since potential creditors are assumed to understand the incentives facing shareholders and are aware of the risks involved when loans are negotiated, ultimately the owner will bear the consequences of the agency problem in terms of a higher cost of debt. Because of

the less favourable terms on which debt can be obtained, agency costs are likely to be decreasing in the level of profits (providing an additional justification of the cashflow terms in many empirical dividend models). Costs may also be increasing in the stock of debt. Chowdhury and Miles (1987), for example, found that such effects did reduce firms' payouts. It is, however, difficult to attribute limits on dividend payments entirely to the possibility of financial distress. The direct costs of bankruptcy, which would have to be substantial for the argument to be sustained, appear to be relatively small [Warner (1977)], although indirect costs may be larger [Altman (1984)].

Signalling

An additional theory of dividend determination, also relating to the dichotomy between ownership and control, stems from signalling theory. The managers of the firm (insiders) typically have better information about its prospects then shareholders (outsiders); however, the latter have a collective interest in receiving news from management in order to improve their portfolio allocation decisions. Information cannot be conveyed directly (for example, by providing specific information on investment plans), since the firms' competitors would also benefit from its availability. Instead, the dividend can represent a useful signalling device [see, for example, Bhattacharya (1979), John and Williams (1985) and Miller and Rock (1986)]. The significance of current cashflow in most existing models of dividend behaviour [for example, King (1977) and Poterba and Summers (1985)] is usually interpreted as supporting signalling theory. Anderson (1983), however, replaces cashflow with investment, a suggestion not subsequently taken up in the literature, on the grounds that the latter provides a superior proxy for insiders expected profit flow.

Both the empirical and theoretical criticisms have been made of the dividend signalling model. At an empirical level, although some studies have suggested that dividend changes do provide a good predictor of future earnings [for instance, Penman (1983), Pettit (1976), Ezzel (1974), Laub (1976) and Edwards et al (1987)] others have indicated that this is not the case [Watts (1973 and 1976), Gonedes (1978) and Riding (1984)]. With regard to theory, it has been argued that the costs involved in false signalling may be low. For example, Edwards (1984) contends that neither the tax nor transactions costs of increasing external financing (as a result of paying a higher dividend) are likely to be negatively related to unobservable future profit prospects. This suggests an additional possible reason for a postulated relationship between mergers and dividends; namely, distribution increases could represent a false signal about the future prospects of the firm, made to assist management to retain control [King (1977)]. That said, if the relationship between management and shareholders is treated as a repeated rather than single period game, factors such as a reluctance to cut dividends in the future, the future compensation of managers, the value of reputation and increased prospective financing costs could provide disincentives to false signalling.

Dividend controls

The final influence on dividend policy addressed here is the effect of government controls. Some form of official restraint of dividends has been in operation for much of the post-war period. The early controls relied on moral suasion, but from the mid 1960s dividend restraint has been statutory; the lifting of controls in the 1979 Budget marked the end of a statutory phase which had been in continuous force since 1972. Fane (1975), King (1977) and *Bank of England Quarterly Bulletin* (1980) found that such controls had little impact. However, more recent studies by Poterba (1984), Poterba and Summers (1985), Mayer and Pashardes (1986), Edwards et al (1987) and Chowdhury and Miles (1987) all identified much more substantial effects.

Part Two: Empirical Results

Most empirical studies of dividend behaviour have assumed a partial adjustment of dividends towards their target level. This suggests the following two equation system. The first equation defines the optimum level of dividends in year t,

$$G_t^* = \alpha_0 + \alpha_1 X_t + u_t \qquad \text{(I)}$$

where G_t^* = desired level of dividends at t
X_t = vector of independent variables

The second equation describes the partial adjustment of actual dividends to the optimum level,

$$\alpha_i (L)\, \Delta G_t = \beta_0 + \beta_1 (G - G^*)_{t-1} + \beta_2 (L)\, \Delta X_{t-1} \qquad \text{(II)}$$

The polynomials [$\alpha_i(L)$ and $\beta_i(L)$] in the lag operators relating to the dependent and independent variables extend the dynamics of the simple partial adjustment model. The equation is evidently of the ECM form.

In this context, the Granger Representation Theorem [Granger (1983)] establishes that for a valid ECM to exist, the variables incorporated in a model must cointegrate. Thus, Engle and Yoo's [Engle and Yoo (1990)] three step estimation procedure is followed. The first phase of the process involves the identification of a co-integrating vector, which is estimated by OLS. In very broad terms, a set of variables is said to co-integrate when the variables trend together with a constant difference over time. This is determined by reference to certain tests which include the DF, ADF and CRDW statistics. In the second stage, the equation dynamics are estimated, using the lagged residuals from the first stage as deviations from the long-run target. The third step involves a correction to the parameter estimates of the first stage regression which makes them asymptotically equivalent to *FIML* and provides a set of standard errors which allows the valid calculation of standard 't' tests.

The most widely used specification adopted for the long run in earlier time series studies of dividend payments [eg Fane (1975), King (1977) and Poterba and Summers (1985)] is;

$$G_t^* = \alpha + \beta PROF + \rho\theta + \lambda DCON \qquad \text{(III)}$$

where

PROF = cashflow
θ = tax discrimination
DCON = dummy variable for periods of dividend control

In this paper, we compare this formulation with other specifications by examining the impact of some additional and alternative regressors. In particular, the effects on dividends of investment [Anderson (1983)], tax exhaustion [Edwards et al (1987)] and merger and acquisitions M&A activity [King (1977)] are investigated.

Many researchers have argued that the dividend relationship should be expressed in nominal terms. It is argued that signals are received and transmitted, and the response to those signals perceived in current value terms. Moreover, specifically in the case of distributions, Edwards et al (1987) point out that many companies do not change their nominal dividends per share from one year to the next, but virtually no company preserves real dividends per share. Nevertheless, in the current exercise it was possible to reject the hypothesis of money illusion and the analysis is therefore conducted in real terms. Both linear and logarithmic functional forms are examined.

Data

Dividends

The series for ICCs' dividend payments published in the National Accounts is net of advance corporation tax from 1973Q2 onwards and consequently requires transforming to put the series on a consistent basis throughout the estimation period. This was carried out so that the dependent variable in the estimation work (*GDIV*) is the company sector's gross distribution. Chart 1 illustrates movements in the series (at constant prices) over the period since 1965.

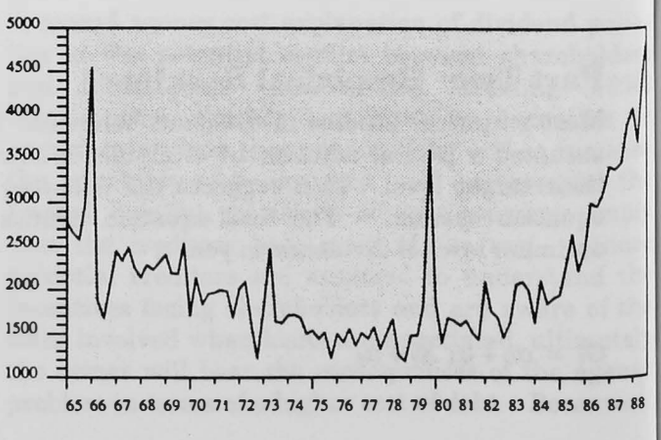
Cashflow

Cashflow is defined here as gross trading profits plus income from abroad and non-trading income less capital consumption and interest and tax payments (*PROF*). No allowance is made for stock appreciation. This was found to dominate alternative possible formulations and a similar definition was used successfully by King (1977).

Both real dividends and cashflow are computed using the GDP deflator.

The dividend payout ratio (that is net dividend payments as a proportion of cashflow) provides

CHART 1: COMPANY DIVIDEND PAYMENTS (GDIV)



perhaps the best summary statistic of trends in the strength of distributions over time. In Chart 2 it can be seen that the payout ratio was high in the 1960s (average of 50.5% from 1963–69), low in the 1970s (average of 23.8%) and moderate in the 1980s (33.7% to 1988). It has moreover been unusually volatile over the most recent time span; high in 1980–82, subdued over 1983–85 and subsequently very strong.

Investment

ICCs' investment at constant prices (*IFI*) is illustrated in Chart 3. Since 1983 capital expenditure has grown remarkably rapidly. Bearing this out, whereas the mean investment/GDP ratio between 1965 and 1979 stood at 7.27%, by 1988 it had reached 10.26%.

By changing the weights attached to particular tax rates, changes over time in the pattern of share ownership have also induced changes in θ. For example, the increase in the proportion of equities held by pension funds—which are exempt from tax—and simultaneous decline in that held by persons has raised the proportion of shareholders indifferent (with regard to tax) between capital gains and distributions.

The tax exhaustion variable used in the present analysis (TAXH) is an updated version of the series provided in Devereux (1987). Using panel data from Datastream Ltd, he calculated the percentage of ACT exhausted companies on an annual basis over the period 1968-90. Quarterly data was obtained by

CHART 2: DIVIDEND/PAYOUT RATIO

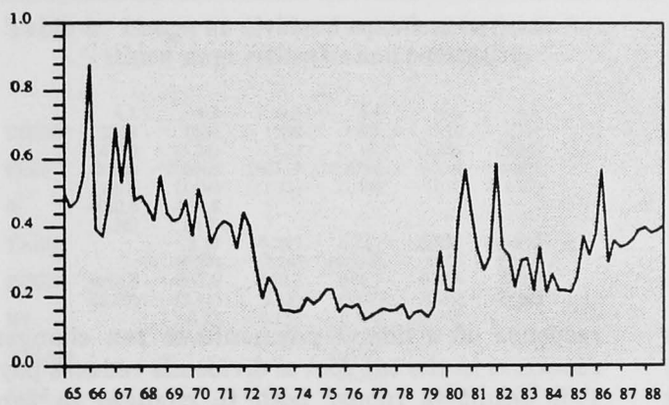


CHART 3: CORPORATE INVESTMENT (IFI)

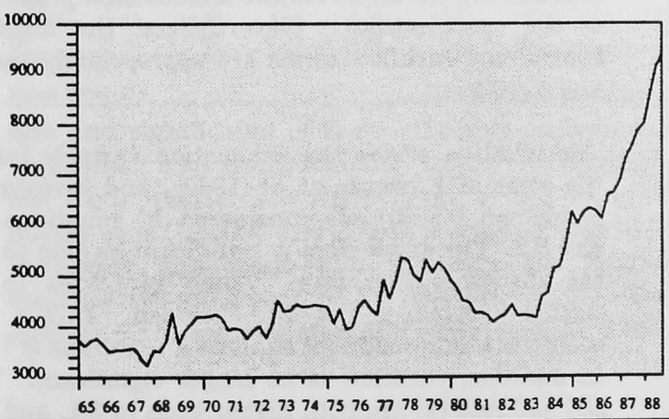


CHART 4: TAX DISCRIMINATION VARIABLE

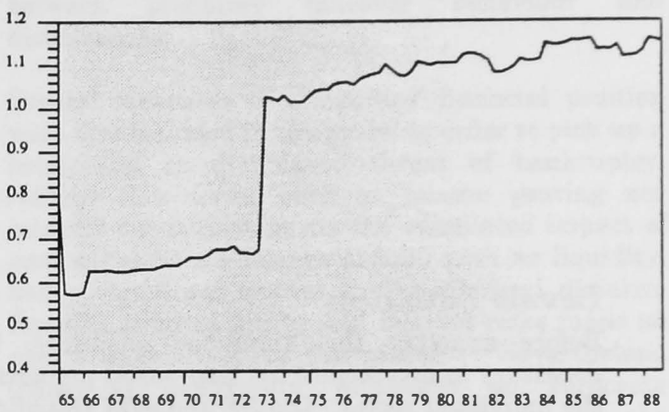
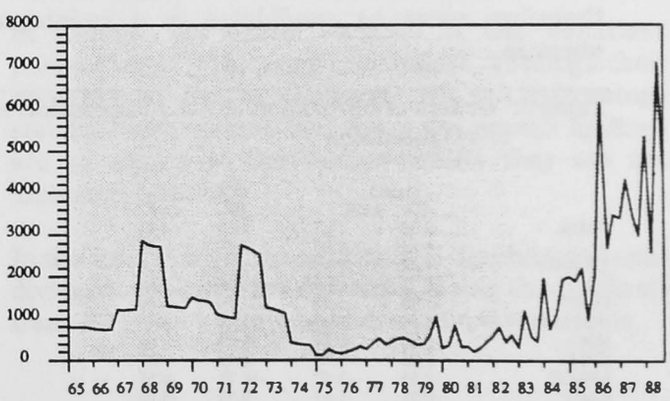


CHART 5: ICCS TOTAL EXPENDITURE ON TAKEOVERS (VALMA)



Tax

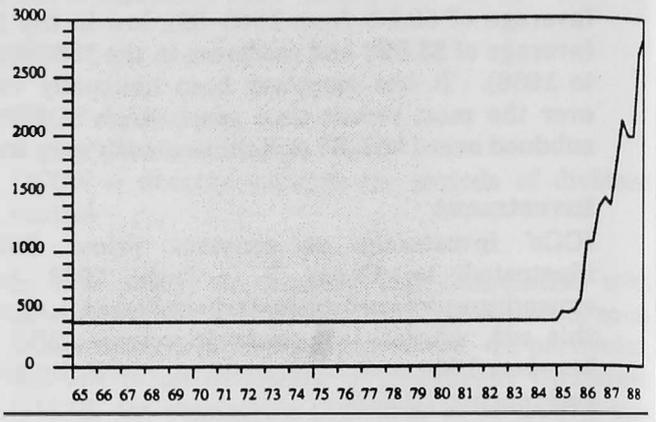
Chart 4 illustrates movements in θ, the tax discrimination variable, since 1965. Step jumps in the series occur in 1965 and 1973 and are associated with changes in the system of corporation tax in place. More modest variations in tax rates have, however, induced some additional movement in the series. For example, the 1988 Budget which cut the top rate of income tax from 60% to 40% reduced θ, since the attractions of capital gains in relation to income for shareholders facing the top marginal rates of tax were weakened.

interpolation. No companies were tax exhausted through to 1972. In 1973, with the introduction of an imputation system of corporation tax, the figure jumps to 10.1%, from which it rose to a peak of 46.5% in 1980. Steady improvements in profitability have led to a decline in tax exhaustion since then.

Two principal series for takeover activity are used; ICCs' total expenditure (*VALMA*) and the value of contested new bids for UK public companies (*SHM*). The former is taken from Financial Statistics and is illustrated in Chart 5. Expenditure has tended to be manifested in a pattern of waves with the latest peak

in activity occurring in 1988–89. The series for the value of contested bids is drawn from Acquisitions Monthly. Unfortunately, data is only available from the first quarter of 1985, in which activity was weak, and thus the figure is held at that level for the period 1965Q1 to 1984Q4. Such a procedure is thought to be defensible since, as Kay (1988) indicates, the recent episode of predatory behaviour has been virtually unprecedented in the United Kingdom. Chart 6 shows an eight quarter moving average of the series. The whole economy investment deflator is applied to both takeover series.

CHART 6: MOVING AVERAGE OF HOSTILE BIDS (SHM)



Levels Equation

Before applying the Engle-Yoo procedure, it is necessary to investigate the time series properties of the individual series. The *DF* and *ADF* statistics for the levels and differences of the variables considered are shown in table two. All of them are I(1) and may therefore serve as candidates in a co-integration exercise.

Table 2: Orders of integration of variables considered in levels equations [a]

	Level		Difference	
	DF	ADF	DF	ADF
PROF	-2.08	-1.7	-11.0	-4.71
θ	-0.84	-1.35	-9.59	-4.96
TAXH	-1.28	-1.35	-9.59	-4.96
IFI	1.73	0.3	-10.23	-2.98
GDIV	-1.75	1.35	-12.49	-5.89
VALMA	-3.67	0.06	-17.9	-4.69
OIP	-0.73	-0.85	-6.03	-4.63
SHM	5.15	1.76	-8.13	-7.95
LPROF	-2.66	-2.08	-10.71	-4.61
Log θ	-0.91	-1.47	-9.54	-5.10
LTAXH	-1.44	-1.62	-9.72	-3.46
LIFI	0.48	-0.22	-10.87	-3.45
LGDIV	-2.59	0.01	-12.20	-6.66
LVALMA	-2.52	-1.0	-14.12	-3.96
LOIP	-1.28	-1.23	-7.3	-5.12
LSHM	2.94	-0.024	-7.80	-6.09

Sample 65:1 88:4

(a) For each variable the number of lags of the dependent variable in the ADF regression was sufficient to ensure that the residuals were white noise. A time trend was included in the regressions for SHM and LSHM [see Mackinnon (1990)].

In table 3, these variables are used to test for the existence of a co-integrating vector for dividend payments using a logarithmic functional form. Equation 3.1 illustrates a traditional model with dividends depending on profits, a dummy variable for periods in which dividends controls were enforced and a tax discrimination variable. An important problem is that log θ is negative implying a perverse response of dividend payments to tax changes—a reduction in the tax cost of dividends reduces payout. This result is robust both to changes in sample period and the substitution of θ for log θ, 3.2 (which it could be argued improves the dimensional properties of the specification). Nevertheless, the dividend control and cashflow terms are appropriately signed and significant.

The addition of the tax exhaustion variable [along the lines of Edwards et al (1987)] and investment [Anderson (1983)] are considered in equations 3.3 and 3.4. Tax exhaustion is significant as long as the tax discrimination term, which continues to be wrongly signed, is not also included. In 3.4, the coefficient on investment exhibits a t-statistic of 1.17. In addition, cashflow is no longer significant. The *DF* and *ADF*(4) are both higher than in 3.1, and the standard error is lower.

Further improvements are obtained throught the consideration of takeover activity. Variations in the incidence of hostile bids exert a much stronger influence than overall movements in M&A. A number of techniques for modelling such forces were examined. One method involved using the level of existing activity as a regressor. In this vein, the number and value of transactions were included separately both as reported and in terms of moving averages. The incorporation of *VALMA*, the published quarterly value of activity produced the most satisfactory results (3.5). The variable enters with a t-statistic of 0.69. However, it reduces the

Table 3: Long-run dividend equations in logs (third stage estimates and t-statistics)

	3.1	3.2	3.3	3.4	3.5	3.6	3.7
CONST	5.554	5.76	2.38	3.834	4.551	3.893	3.126
	(5.44)	(5.47)	(1.05)	(2.11)	(2.16)	(2.9)	(3.13)
LPROF	0.35	0.245	0.174	0.182	0.17	0.25	0.217
	(2.01)	(2.0)	(1.38)	(1.43)	(1.37)	(2.61)	(2.5)
θ		-0.211					
		(1.57)					
log θ	-0.184		-0.506				
	(1.71)		(1.03)				
LTAXH			0.017	-0.0487	-0.0339	-0.0291	-0.0398
			(0.25)	(2.1)	(1.07)	(1.6)	(3.14)
DCON	-0.391	-0.345	-0.309	-0.298	-0.282	-0.3	-0.286
	(4.72)	(4.77)	(4.07)	(3.9)	(3.53)	(5.31)	(5.27)
LIFI			0.439	0.281	0.17	0.18	
			(1.56)	(1.17)	(0.58)	(0.82)	
LVALMA					0.037		
					(0.69)		
LSHM						0.529	0.458
						(3.42)	(3.58)
R^2	0.50	0.50	0.54	0.5	0.54	0.6	0.59
SEE	0.184	0.184	0.18	0.18	0.179	0.168	0.167
CRDW	1.48	1.47	1.50	1.49	1.47	1.73	1.71
DF	-7.1	-7.1	-7.27	-7.18	-7.13	-8.16	-8.09
ADF(4)	-2.75	-2.8	-3.7	-3.82	-4.04	-5.12	-5.06

Sample 1965:1 88:4

Table 4: Long-run dividend equations in linear form (third stage estimates and t-statistics)

	4.1	4.2	4.3	4.4	4.5	4.6
CONST	2028	1604	1386	1405	1310	1251
	(4.53)	(3.26)	(3.2)	(3.19)	(3.58)	(3.85)
PROF	0.108	0.0665	0.0719	0.0748	0.139	0.093
	(1.63)	(1.04)	(1.11)	(1.14)	(1.8)	(1.87)
θ	-462.6	-854.8				
	(1.36)	(0.9)				
TAXH		-2.38	-9.283	-8.167	-6.885	-6.932
		(0.27)	(2.24)	(1.535)	(1.7)	(2.34)
DCON	-664.9	-551.9	-560.2	-556.7	-658.4	569.3
	(3.59)	(3.11)	3.12)	(3.07)	(3.86)	(3.92)
IFI		0.23	0.132	0.109	-0.0439	
		(1.53)	(1.25)	(0.877)	(0.3)	
VALMA				0.0321		
				(0.33)		
SHM					1.152	1.328
					(2.21)	(2.56)
R^2	0.42	0.47	0.47	0.47	0.52	0.52
SEE	430.1	416.5	414.6	415.7	396.5	394.8
SEE	21.9	21.3	21.2	21.2	20.3	20.2
CRDW	1.52	1.59	1.58	1.56	1.74	1.72
DF	-7.22	-7.60	-7.54	-7.47	-8.2	-8.1
ADF(4)	-3.44	-4.8	-4.93	-5.15	-6.0	-6.0

Sample 1965:1 88:4

size and significance of the coefficients on both the investment and tax exhaustion terms. In contrast, the eight quarter moving average of the value of hostile bids (*LSHM*) exerts both a stronger effect—it is highly significant—and improves the overall econometric properties of the equation (3.6). The *ADF* is 8.16 and the standard error falls to 0.168.

Capital expenditurei continues to be nsignificant and can be dropped, although the tax exhaustion variable is retained.

An alternative technique for modelling the effects of M&A activity is to include the incentives to acquire in the equation. In this context, for the general level of activity, a considerable body of research has suggested a positive association between mergers and share prices [eg, Weston (1953), Nelson (1959), Mueller (1980) and Melicher et al (1983)]. It was found, however, that real equity prices entered the equation insignificantly with a negative sign. The incentives to undertake hostile mergers are, unfortunately, not readily amenable to econometric analysis; they include, for example, the availability of low grade debt finance. Overall, however, these results provide strong evidence of a positive link between predatory takeover behaviour and distributions.

Several measures of companies' financial position were also included in the model in order to pick up a heightened or diminished threat of bankruptcy. Neither flow terms such as income gearing nor integral terms (picking up the cumulated impact of past decisions on balance sheets) such as liquidity, had a significant impact on the dividend decision. Equally, nominal and/or real interest rates made no useful contribution to the model. Nevertheless, threat of bankruptcy influences on corporate behaviour are probably partly conveyed by the cashflow variable.

In general the linear versions of the equations produce broadly the same conclusions, although their goodness of fit, as indicated by the percentage standard error is inferior. Since the overall findings are so similar to the earlier results they are not discussed further.

In the next section, the results of estimating dynamic dividend equations are described, using the residuals from the levels equations as error correction terms.

Dynamic Equations

In the second stage of the Granger and Yoo procedure an equation of the form

$$\Delta Y_t = k + \sum_{i=1}^{n} \alpha_i \Delta Y_{t-i} + \sum_{i=1}^{n} \beta_i \Delta X_{t-1} + \lambda_i (Y - Y^*)_{t-1}$$

is estimated, where

Y_t is the dependent variable;
X_t is the vector of independent variables;
and $Y\text{-}Y^*$ is given by the vector of residuals from the first stage regression.

In the present paper, up to five lags on each of the delta form regressors were initially permitted. Subsequently a simplification search was undertaken

in order to provide a more parsimonious model. In all of the dynamic equations estimated, error correction terms based on the levels equations in table 3 prove highly significant. Three log formulations are reported based on long-run vectors 3.7, 3.4 and 3.1. It was found that unless the hostile merger variable (*LSHM*) is included in the equilibrium relation, the short-run equation severly underestimates recent growth in dividend payments.

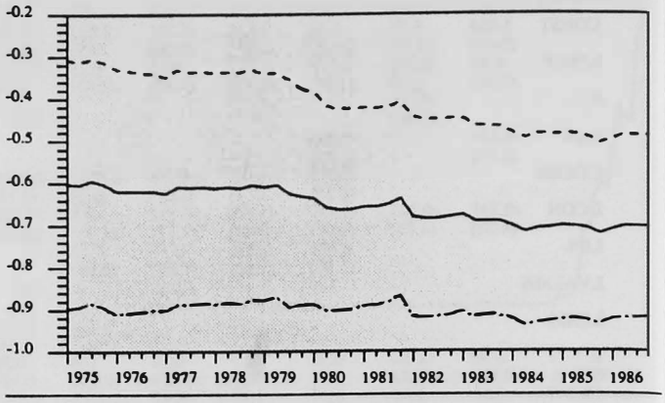
Equation 5.1 represents the most satisfactory specification obtained using 3.7 (based on cash flow, controls, hostile bids and tax exhaustion) as the long-run target. A broad range of econometric tests are passed (in particular post-sample parameter stability is excellent with a $x^2(8)$ of 3.72) and an appropriate dynamic structure obtained. Although the tax discrimination variable proved insignificant in the long-run equation, such effects do seem to be important in the short run. The changes in the company tax system in 1966Q2 and 1973Q2 provided an incentive to bring dividend payments forward in 1966 and to delay payments in 1973. In each case a switching plus one/minus one dummy was used to capture the effects of such behaviour. In addition, a dummy picking up the ending of dividend controls in 1979 is included. A further feature is that whilst investment is insignificant in the preferred co-integrating vector, it shows up strongly with a positive sign (lagged four periods) in the difference form of the equation. The first lag of the dependent variable is also significant. No additional difference terms—cash flow, other financial variables or acquisitions expenditure—could be introduced.

Table 5: Difference equations in logs

	5.1	5.2	5.3
CONSTANT	-0.00462	-0.00629	-0.00783
	(0.33)	(0.42)	(0.52)
ΔDTIME1	0.244	0.26	0.266
	(4.19)	(4.27)	(4.35)
ΔDTIME2	0.09	0.0916	0.0848
	(1.66)	(1.6)	(1.47)
ΔSTRUC	0.54	0.572	0.591
	(5.37)	(5.43)	(5.63)
$\Delta LIFL_4$	0.857	0.804	0.924
	(3.16)	(2.81)	(3.23)
$\Delta LGDIV._1$	0.258	0.193	0.195
	(2.99)	(2.21)	(2.19)
$RES._1$	-0.703[a]	-0.552[b]	-0.523[c]
	(5.95)	(4.93)	(4.78)
R^2	0.649	0.612	0.61
SEE	0.131	0.138	0.139
DW	2.07	2.08	2.08
ARCH(1)	0.073	0.044	0.008
LM(4)	4.56	5.33	5.89
LM(8)	7.03	7.26	7.38
RESET(4)	1.38	1.39	0.21
BJ(2)	0.48	0.024	0.664
$x^2(8)$	3.72	17.77	33.69
%RMSE	283.5	654.1	950.3

(a) based on 3.7.
(b) based on 3.4.
(c) based on 3.1.

CHART 7: RECURSIVE ESTIMATION TIME SERIES OF RES-1



Given that dividend equations have typically broken down badly recently, in the sense of proving structurally unstable, it was felt that the structural stability of 5.1 should be investigated more methodically than is allowed by the simple forecasting test. In the first place it should be borne in mind that the dividend time series is extremely volatile. Charts 7, 8 and 9 show the recursive estimates of the behavioural variable in the model,

CHART 8: RECURSIVE ESTIMATION TIME SERIES OF Δ LIFI-4

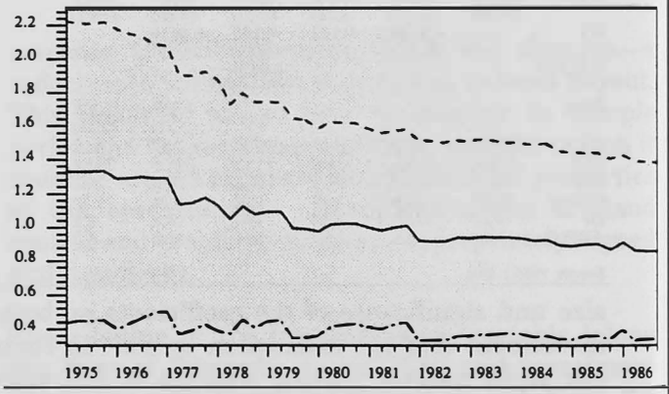
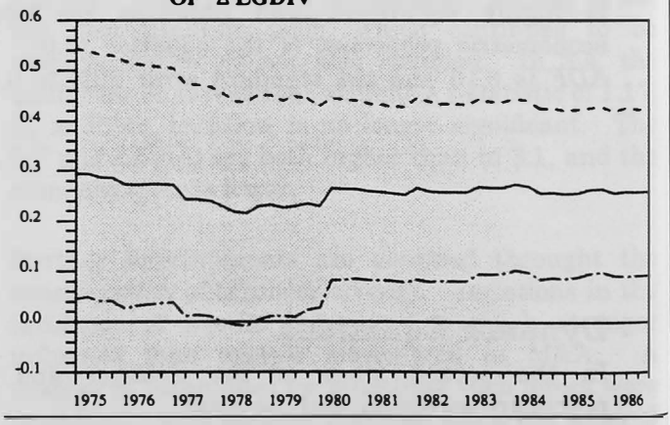
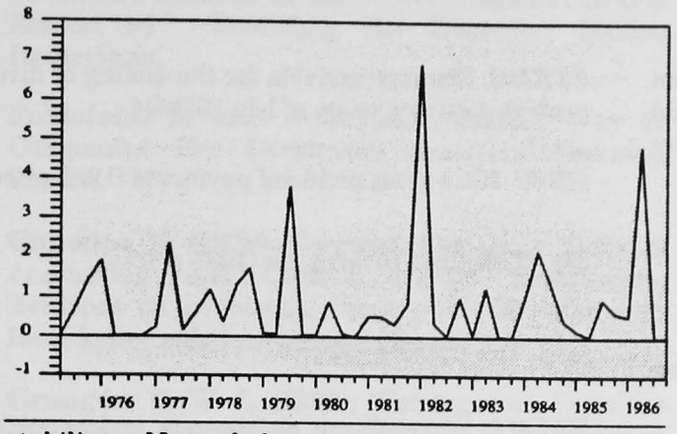


CHART 9: RECURSIVE ESTIMATION TIME SERIES OF Δ LGDIV



the error correction term, $\Delta LIFI_{-4}$ and $\Delta LGDIV_{-1}$. After some initial movement, these come on track quickly and display no more than small and random variations. Chart 10 shows the sequential one period Chow test. In this, the coefficients in the long-run solution are held constant at their full sample values, biasing the results towards an acceptance of

CHART 10: SEQUENTIAL ONE PERIOD CHOW TEST



stability. Nevertheless, over the period 1975Q1 to 1986Q4 the test is failed only twice at the 5% level and then only by modest amounts. Since we might expect the test to be failed once in every twenty applications this is not an unacceptable result.

Equation 5.2 provides an alternative specification of the dividend equation, abstracting from the effects of hostile M&A activity, and the long-run solution is determined by profits, dividend controls, tax exhaustion and investment (3.4). Both within and post-sample performance are inferior to that of 5.1, with the standard error rising to 0.138 and $x^2(8)$ to 17.77. Equation 5.3 which excludes tax exhaustion and investment from the long-run solution, but includes the tax discrimination variable displays still less attractive characteristics.

Finally, the linear version of the model is estimated. Entering the residuals from equation 4.6 in a dynamic model for dividends gives the results,

$$\Delta GDIV = \underset{(0.25)}{-7.3} + \underset{(7.11)}{950.9}\,\Delta DTIME1 + \underset{(2.0)}{224.9}\Delta DTIME2$$

$$+ \underset{(7.23)}{1{,}565.1}\Delta STRUC + \underset{(2.53)}{0.322}\Delta IFI_{-4} + \underset{(3.63)}{0.273}\Delta GDIV_{-1}$$

$$\underset{(5.02)}{-0.541}RES_{-1}\ ^{(a)}$$

(a) based on 4.6

R^2=0.74
SEE=274.11
%SEE= 71.19
DW=2.18
ARCH(1)=0.19
LM(4)=6.65
LM(8)= 10.26
RESET(4) =0.55
BJ(2)=6.01
$x^2(8)$= 11.58
% RMSE=182.8

Clearly this suggests a very similar pattern of experience to 5.1. Nevertheless, the percentage standard error is higher and the $BJ(2)$ test is failed, both of which indicate that a logarithmic specification is preferable.

Conclusion

This paper goes some way towards providing an explanation of recent trends in recorded dividend payments. In large measure, recent increases are attributed to the development of hostile M&A activity. In addition, however, tax effects are likely to have played some role, although movements in the incidence of tax exhaustion rather than changes in tax rates appear to have exerted the greater long-run influence. Management-shareholder signalling behaviour is also likely to have been present. In this context, a main contention is that changes in managerial confidence are more appropriately proxied, in the short run, by investment expenditure than current cash flow. The latter is nonetheless important in the long run.

Key

PROF Gross trading profits plus income from abroad plus non trading income minus capital consumption minus interest payments minus tax payments (1985 prices).

θ Tax discrimination variable.

TAXH Incidence of tax exhaustion.

DCON Dummy variable for dividend controls taking a value of 1 between 1972Q3 and 1979Q2.

DTIME1 Dummy variable for the change to a classical system of corporation tax taking a value of 1 in 1966Q1 and -1 in 1966Q2.

DTIME2 Dummy variable for the introduction of an imputation system of corporation tax taking a value of -1 in 1973Q1 and 1 in 1973Q2.

STRUC Dummy variable for the ending of dividend controls taking a value of 1 in 1979Q4.

GDIV ICCs gross dividend payments (1985 prices).

IFI ICCs fixed investment (1985 prices).

OIP ICCs interest payments (1985 prices).

VALMA Expenditure on mergers and acquisitions (1985 prices).

SHM Value of contested bids (1985 prices).

L prefix indicates that the variable is transformed into logs.

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