Earnings management and deferred tax

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Abstract—This study analyses the deferred tax provisions of firms during a period in which the firms' incentive to manage earnings may have been be particularly strong and in which firms made disclosures in relation to partial deferred tax provisions which revealed readily their under- or over-provision of deferred tax. Using a sample of 58 firms for the two years 1991 and 1992, the magnitude of the under- or over-provisions found is economically significant, amounting, on average, to around 20% of the maximum potential deferred tax liability and, more important, 9% of profit or loss before tax. This paper takes such under- and over-provision of deferred tax and investigates its relationship with a number of posited explanatory variables – as derived and developed from the earnings management literature. In a multivariate setting it is found that the level of under-/over-provision is related to the following characteristics: whether the firm is reporting a pre-tax loss or a pre-tax profit; the extent of adjustment to prior year tax; and the level of surplus advance corporation tax (ACT). These findings support a general profit-smoothing hypothesis, and the finding in relation to ACT suggests that firms take an overall view in determining the required level of provision in order to manage earnings, rather than concentrating upon particular line items. There is also weaker evidence of a relationship between the level of under-/over-provision and firms' levels of gearing and effective tax rates.

1. Introduction

While recent disclosures concerning Enron and WorldCom provide stark evidence of the ability and willingness of managers to manipulate or misstate financial accounting items, the academic literature has not, until recently, shown earnings management to have had a significant effect on reported earnings (Dechow and Skinner, 2000). This failing has been attributed in part to methodological issues and also to a lack of focus on capital market incentives to manage earnings.

This paper makes three main contributions to the literature, using data for UK firms. First, in employing a novel methodology, the results have the potential to corroborate and strengthen findings based on existing methodology. Second, the paper investigates earnings management by focussing upon deferred tax provisioning – an area of financial accounting practice which is both relatively complex and highly subjective, and in which, therefore, the opportunity to manage earnings is correspondingly heightened. Although the current UK financial reporting standard covering deferred taxation, *Financial Reporting Standard 19: Deferred Tax*[1] (FRS19) allows some discretion in arriving at the required deferred tax provision, the latitude now permissible is considerably less than that which was previously available under *Statement of Standard Accounting Practice 15: Accounting for Deferred Tax*[2] (SSAP15) – the provisions of which set the UK apart as a rare jurisdiction in which partial provisioning was widely used.[3] Consequently, the paper focuses on provisions made under SSAP15. The paper's third main contribution derives from the particular setting adopted, which allows for the testing of new hypotheses relating to earnings management and the influence of tax reporting considerations that are still relevant post SSAP15.

The research design utilises information from published financial statements in order to identify the occurrence and extent of under- and over-providing for deferred taxation. At any point there may be a difference between the amount of the deferred tax provision as computed on the basis of partial provision, and the 'maximum potential pro-

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[1] FRS19, Accounting Standards Board. Issued December 2000, effective in respect of years ending on or after 23 January 2002.

[2] SSAP15, Accounting Standards Committee, adopted by the Accounting Standards Board. Issued October 1978, revised May 1985, amended October and December 1992.

[3] In contrast, for example, to the position in the United States, Japan, Australia, France, Germany, Italy and Canada (Choi, 1991); and in contrast, additionally, to the position in the Netherlands and Sweden (Archer et al., 1995).

vision' (i.e., computed on the full provision basis) – this difference being the so-called amount of 'unprovided' deferred tax. Under four assumptions (which are discussed in the later section upon research design and hypotheses), the unprovided deferred tax as at the beginning of the forecasting period should equal the maximum potential deferred liability subsequently disclosed at the end of the forecasting period. The Appendix demonstrates this relationship numerically.[4] Any excess (deficit) of unprovided deferred tax as at the beginning of the forecasting period over (under) the maximum potential deferred tax liability subsequently disclosed at the end of the forecasting period can be interpreted as an under-provision (over-provision) as at the beginning of the forecasting period. Thus, the researcher may derive a measure of under/over-provision from publicly available information. The paper links such under/over-provision with incentives to manage earnings, whilst recognising (and controlling for) the possibility that under/over-provisioning may, to some extent, result from forecasting error independent of earnings management. The relationship of under/over-provisioning with a number of firm-specific variables, posited to be indicative of propensity to manage earnings, is investigated – the variables employed being a combination of those used in previous studies and a number developed in the context of this paper.

The analysis finds that the majority of firms over-provided for deferred tax during the period under review, on average by 9% of pre-tax profits in 1991, 8% in 1992. Of the sub-sample of firms which under-provided, the amounts of under-provision represented 9% and 52% of pre-tax profits. Drawing correct inferences concerning earnings management incentives depends upon controlling for forecasting difficulty, and upon the appropriateness of the proxy employed in this respect. The choice of this proxy is considered in detail under Section 3.2. Having controlled for variation in the predictability of firms' earnings, a proxy for forecasting difficulty, relationships between the level of under- and over-provision and the following factors, consistent with an earnings management motivation, are found: whether the company reports a pre-tax profit or a pre-tax loss; the level of adjustment to prior year tax; and the level of surplus advance corporation tax (ACT). There is also weaker evidence of gearing and relative effective tax rate burdens being associated with the level of under/over-provision.

The remainder of the paper proceeds as follows: the next section covers prior research and accounting for deferred tax; the third section sets out the research design and hypotheses; the fourth section presents and discusses results; and the final section summarises and concludes.

2. Prior research and accounting for deferred taxation

This section contains a discussion of the extant literature upon earnings management in general; a discussion of the literature upon earnings management and deferred tax; and a summary of the financial accounting and reporting requirements in respect of deferred tax. The discussion of the general earnings management literature focuses on two issues: first, it summarises contrasting approaches to the detection and quantification of earnings management, and motivates the approach adopted in this paper; and second, it sets out the various settings and motivations for earnings management which have been examined in recent research, thereby providing a context for the development of hypotheses in the next section.

2.1. Methodological approaches in the study of earnings management

Three distinct approaches are seen within the earnings management literature (McNichols, 2000).[5] Initial studies focused on decomposing observed total accruals[6] into their non-discretionary (unmanaged) and discretionary (managed) elements. Most studies in this area are related to the Jones (1991) time-series model,[7] which, despite its popularity, has methodological limitations. Dechow et al. (1995) evaluate various models including the Jones and modified Jones models. Although all the models they considered produce reasonably well-specified tests, the authors conclude that the power of the tests is relatively low. Similarly, Young (1999) assessed the relative performance of a number of alternative models and concluded that the level of measurement error in decomposing total accruals is significant.[8] Testing

[4] The Appendix uses the example of accelerated capital allowances, but the relationship demonstrated holds for a wider variety (and mix) of timing differences.

[5] In the light of recent extensive surveys and discussions of the earnings management literature, this section focuses only on those studies relevant to the approach adopted in this paper. Readers requiring a wider discussion of research design issues are referred to Dechow and Skinner (2000), McNichols (2000) and Beaver (2002).

[6] The definition of total accruals, varying across a range of studies, has included all of the following: total accruals including or excluding depreciation; total accruals including or excluding long term accruals; and working capital accruals.

[7] The basic methodology is to regress a measure of total accruals as dependent variable upon independent variables designed to control for non-discretionary income/expense items, thereby allowing extraction of a measure of discretionary accruals. Developments of this method include cross-sectional and time series approaches.

[8] Young (1999) also tests a number of suggestions for improving specification, including the use of additional regressors to control for sources of non-discretionary accruals, e.g., cash-flow growth, fixed asset intensity and average fixed asset life.

various models in a cross-sectional form, Peasnell et al. (2000a) corroborate US findings regarding model specification. They conclude, in addition, that the most appropriate model in terms of power is setting specific.

Partly in response to the foregoing general concerns, a second approach has developed in which investigation is focused upon specific line items rather than on examination of total accruals.[9] In focusing on specific profit and loss items which, by design, are those of the more subjective areas of income determination, this second approach provides a setting in which the expectation of detection of earnings management is higher. This approach has the additional advantage that, in using item-specific variables, the precision with which the unmanaged or non-discretionary variables are measured is increased (Beaver, 2002). The variety of profit and loss items examined by this approach is discussed in the next sub-section. The approach, however, albeit focused on the more subjective areas of financial reporting, does not of itself necessarily result in examination of settings where incentives to manage earnings are the strongest.

A third approach addresses this concern by concentrating upon settings where ex ante there appear to be strong incentives to meet 'critical' or 'target' earnings figures. This approach is motivated by the belief that clearer insights concerning incentives to manage earnings will be obtained by examining firms' behaviour in particular contexts. The influence of capital markets on firms' performance and, increasingly, on levels of managerial remuneration provides settings where strong incentives to manage earnings may be anticipated (Dechow and Skinner, 2000). Studies in this area adopt a common approach in focusing on the distribution of earnings around a target level of profit, whether that target be the previous period's level of profit, zero profit, or the level of analysts' forecasts. The research is based on an expectation, absent earnings management, of unbiased distributions of firm-reported profits around any particular level of earnings. Consequently, the method is not dependent upon first distilling non-discretionary from total accruals. It does not, however, offer insights concerning the mechanisms by which the desired level of earnings is achieved.

2.2. *Settings for study of earnings management*

Investigation was initially upon incentives to manage earnings as implied by the costly contracting literature (Watts and Zimmerman, 1978).[10] The focus of these studies is upon contractual settings between firms' managers and suppliers of debt (leverage hypothesis), and between managers and shareholders in respect of the supply of management services (bonus plan hypothesis); and also upon the implicit and explicit contracts between firms' managers and the state (size hypothesis). While early hypotheses centred on accounting policy choice, subsequent work investigated earnings management within a given set of accounting policies. For example, evidence of earnings management has been detected in the following settings (or with the following motivations): high leverage and close proximity to debt covenant violations (DeFond and Jiambalvo, 1994); to increase accounting based management compensation (Guidry et al., 1999); and circumvention or reduction in the impact of regulation (Collins et al., 1995).

The specific line items which have been examined include bank loan provisions (Liu et al., 1997), insurers' claim loss provisions (Beaver and McNichols, 1998) and deferred tax valuation allowances (Visvanathan, 1998, Miller and Skinner, 1998, and Bauman et al., 2001).[11] In the UK, a recent paper upon the valuation relevance of partial provisioning finds evidence which is indicative of earnings management and calls for further research upon this issue (Citron, 2001). This view is supported by anecdotal UK evidence found in Curtis (1995), which posits the deferred tax provision as being determined in order to achieve a desired effective tax rate.

Studies based on capital market incentives have found evidence of earnings management which appears to be motivated by firms attempting to avoid reporting a loss or a year on year earnings decline (Burgstahler and Dichev, 1997, and Burgstahler, 1997); mitigating the extent of extreme financial performance (Guay et al., 1996); smoothing around a target income figure (DeFond and Park, 1997, and Young, 1998); attempting to meet market expectations as proxied by analysts' forecasts[12] (Degeorge et al., 1999); and increasing earnings in anticipation of a share issue (Rangan, 1998, and Teoh et al., 1998). While the evidence appears compelling, it does not consider the mechanisms by which capital market considerations in-

[9] While the initial focus on total accruals has been superseded in studies attempting to discover the extent of earnings management, it is still, however, an appropriate vehicle for examining, for example, the moderating role of governance structures, etc. on the level of earnings management (and in which context it would be inappropriate to focus on a single line item or on a limited number of line items). For a discussion of the methodological issues and approaches see Peasnell et al. (2000a).

[10] For a full discussion of the costly contracting based earnings management research see Healy and Wahlen (1999).

[11] Since the valuation allowances issue is specific to the US, it is not considered in detail in this paper. For a review of the associated literature see Bauman et al. (2001).

[12] It is a moot point as to what or whom is being managed – earnings or analysts?

fluence firms to managing earnings.

2.3. Accounting for deferred taxation

In the period under review, UK firms were required under the provisions of SSAP15 to provide under the liability method to the extent that it was 'probable that a liability or asset will crystallise' (SSAP15, para. 25).[13] In determining the required provision, firms were required to net off the various effects of each timing difference and only consider the overall position. The Appendix to the SSAP (SSAP15, Appendix, para. 4) states in general that in estimating likely reversals, the forecasting 'period may be relatively short – say three to five years'. An additional consideration is the SSAP's provisions concerning the interaction between ACT and deferred tax: the deferred tax charge/credit could be influenced by an associated write back/off of ACT when it is deemed that surplus ACT could be set off against future corporate tax liabilities.[14]

SSAP 15 has now been superseded by FRS19. This standard requires, inter alia, that deferred tax be computed on a full provision basis where provision is required,[15] rather than on the partial provision basis formerly required by the SSAP. This prescription as to computation basis would appear, ceteris paribus, to be likely to reduce the opportunity for earnings management via the deferred tax charge. Deferred tax, however, remains a relatively complex area of accounting: the new standard allows, indeed requires, firms to form expectations concerning their future, apply judgment and make choices in accounting for deferred tax. The impacts of adoption of FRS19, including any impact upon earnings management via the deferred tax charge, would appear to be an important area for future research.

3. Research design and hypotheses

3.1. Measurement of earnings management under the partial provision basis

Under four assumptions (which follow), the unprovided deferred tax as at any balance sheet date would equal the maximum potential deferred tax at the end of the forecasting period, since the net timing differences assessed at the beginning of the forecasting period as being unlikely to reverse in that period (and only those timing differences) would be left to reverse in subsequent periods. The four assumptions required are: (i) a neutral, bias-free accounting and computation system; (ii) length of forecasting period for deferred tax calculation purposes,[16] (iii) perfect foresight at the beginning of the forecasting period; and (iv) provision be made only in respect of timing differences whose reversal is inevitable,[17] i.e., excluding those related to tax on rolled-over or held-over chargeable gains, tax on potential remittances of overseas income, and trading losses or surplus ACT in excess of the maximum amounts which may be off-set. The fourth assumption may be handled by suitable sample selection. With the first three assumptions and with suitable sample selection, therefore:

$$MP_t - P_t = MP_{t+x} \quad (1)$$

where MP_t and P_t are, respectively, the maximum potential deferred tax and the amount of deferred tax actually provided at time t, and x is the length of the forecasting period. In expression (1), a deferred tax provision (profit and loss account debit, balance sheet credit) is treated as a positive quantity. This convention carries to expressions (2) and (3).

In the real world of potential bias and uncertainty, the amount of deferred tax unprovided at time t in excess of the maximum potential deferred tax as at the end of the forecasting period constitutes an

[13] As a result, however, of a 1992 amendment relating to pensions and other post-retirement benefits, firms could use the 'same recognition criteria for the deferred tax implication of pensions and other post-retirement benefits as in accounting for those obligations to provide those benefits' (SSAP 15, para. 12A), i.e., use of a full provision basis was an option.

[14] Under the UK imputation system of taxation during the period under review, when a company paid a dividend, advance corporation tax (ACT) equal to the product of the lower rate of income tax and the gross dividend was due to the Inland Revenue. Shareholders received the net dividend, equal to the gross dividend less ACT paid (i.e., a net dividend plus an imputed tax credit, the sum of which equalled the gross dividend). The ACT represented a prepayment of corporation tax by the company, available for offset against the company's assessed corporation tax liability for the period. This offset, however, was limited to the amount of ACT which would have been payable had the company paid a gross dividend equal to its taxable profits for the period. This restriction could lead to firms having 'surplus' ACT for a period, for which the required accounting treatment was either carry forward as a tax asset for relief against future periods' mainstream corporation tax liabilities, if such offset was reasonably expected; or, if the ACT was deemed irrecoverable, write off through the taxation line in the profit and loss account. ACT written off could, however, be written back in subsequent periods if its availability for offset against mainstream corporation tax liability was established. The requirement that ACT be paid in respect of dividend payments by companies was removed with effect from 6 April 1999, although shareholders are still deemed to receive net dividends with an associated tax credit.

[15] The standard is also explicit in its prohibitions as to the types of timing difference upon which deferred tax may not be provided.

[16] Since length of forecasting period, not disclosed in financial statements nor otherwise publicly available, dictates the number of future periods for which expected net timing differences need be considered.

[17] Inevitable in the sense that, given no change in regulation and no further action by the firm, the timing difference in respect of each item will necessarily reverse. For example, reversal of an excess of capital allowances over book depreciation in respect of an asset is inevitable, but crystallisation of a held over gain on an asset is not inevitable (in as much as crystallisation is contingent, inter alia, upon sale of the asset).

under-provision of deferred tax at time t (and the reverse would represent an over-provision):

$$\left.\begin{array}{ll} MP_t - P_t > MP_{t+x} & \Rightarrow \textit{underprovision at time } t \\ MP_t - P_t = MP_{t+x} & \Rightarrow \textit{no under or overprovision at time } t \\ MP_t - P_t < MP_{t+x} & \Rightarrow \textit{overprovision at time } t \end{array}\right\} \quad (2)$$

In the following analyses the dependent variable, PD_t (provisioning difference at time t), is under (over) provision expressed as a percentage of the maximum potential deferred tax liability as at time t.[18] This variable must be bounded below by the amount provided expressed as a percentage of the maximum potential deferred tax liability (to ensure that any excess of originating timing differences over reversals during the forecasting period cannot erroneously inflate the measure of over-provision – since such excess cannot be recognised for financial accounting purposes); and there must be control for the possibility that the maximum potential deferred tax at the end of the forecasting period is, in fact, a debit (thereby ensuring that under-provision plus the actual provision at time t is limited by the maximum potential deferred tax liability at time t):

$$PD_{t,x} = \begin{cases} \dfrac{(MP_t - P_t)}{MP_t} \times 100 & \text{if } MP_{t+x} < 0 \\ \dfrac{-P_t}{MP_t} \times 100 & \text{if } (MP_t - P_t) - MP_{t+x} < -P_t \\ \dfrac{(MP_t - P_t) - MP_{t+x}}{MP_t} \times 100 & \text{otherwise} \end{cases} \quad (3)$$

The second subscript, x, on PD represents the length of the forecasting period. Increasing positive (negative) values of PD represent higher levels of under (over) provision at time t relative to the maximum potential deferred tax liability at that time.

We also define a mean of this variable over a forecasting period of x years, to generate an alternative, aggregate dependent variable as follows:

$$\overline{PD}_{t,x} = \left(\sum_{i=1}^{x} PD_{t,i}\right) \Big/ x \quad (4)$$

These variables may be computed readily by reference to figures disclosed in published financial statements.

The dependent variable PD[19] is designed to capture earnings management via deferred taxation. In this context intentionality is key, and the possibility that under/over-provisioning is, to some extent, due to inaccurate forecasting (e.g. of capital expenditure) must be taken into account. The assumption of perfect foresight, therefore, may not be maintained, and we write:

$$PD = EM \pm FE \quad (5)$$

where EM represents the amount of under/over-provisioning due to earnings management, and FE the amount of under/over-provisioning which results from inaccurate forecasting. In the following analysis, therefore, there must be a control for FE. This is achieved by adoption of a control variable, as discussed in Section 3.2.

3.2. Hypotheses

The following alternative hypotheses are designed to investigate any association between earnings management and a number of posited explanatory variables.[20] In each case, a brief explanation of the hypothesised relationship is given, along with a definition of the relevant explanatory variable.[21] Table 1 summarises these variables, definitions and hypotheses.

Gearing. Reduction of the amount of taxation expensed by under-providing deferred tax would result in an improvement in a firm's apparent ability to service its existing level of debt and its ability to attract additional debt on favourable terms. At extreme levels of gearing, deliberate under providing could avoid the breach of loan convents. The variable *GEAR* is defined as the firm's capital gearing ratio.[22]

$H_1(A)$: *There is a positive (negative) association between level of gearing and the extent of any under- (over-) provision of deferred tax*

Profitability. A firm might attempt to reduce a pre-tax loss by under-providing deferred tax. When a firm is reporting a pre-tax profit this incentive may not exist, and could be replaced by an incentive to reduce profits (i.e., to smooth profits). The variable *PROFIT*, designed to capture a firm's profit status, is defined as a binary variable to be 1 if the firm's pre-tax profit[23] is positive, 0 otherwise.

$H_1(B)$: *There is a negative (positive) association between profit status and the extent of any under- (over-) provision of deferred tax*

[18] This variable may capture not only earnings management, but also, potentially, lack of perfect foresight at the beginning of the forecasting period. In the analysis which follows, a proxy for lack of perfect foresight and forecasting error is incorporated as a control variable (alternative proxies being employed to test results sensitivity in this respect).

[19] Subscripts omitted for the remainder of Section 3.1.

[20] As against the null hypothesis of no relationship in each case.

[21] For ease of reading, variable names are cited in this section without time subscripts.

[22] *Datastream* item 731.

[23] *Datastream* item 154.

[24] Investors' expectations concerning the level of earnings could be a strong target. It is not possible, however, to formulate a suitable test variable in this respect since the available proxies are based on earnings *after taxation*. See for example, the I/B/E/S definition of earnings per share. A univariate analysis, however, based on the level of under-/over-provision and a measure of the difference between the mean of analysts' EPS forecasts and reported after tax earnings, is reported in the next section.

Table 1
Summary of variables and hypotheses as to relationship between dependent and explanatory variables

	Variable name	*Definition*	*Hypothesised sign*
Dependent	$PD_{t,x}$	Under- (over-) provision of deferred tax in year t as a proportion of the maximum potential deferred tax provision in year t, assuming a forecasting period for deferred tax purposes of x years. Five alternative formulations: $x = 1, 2, 3$ and 4; and an aggregate formulation, being the arithmetic mean of the variable under the other formulations.	Not applicable
Explanatory (time subscripts omitted)	*GEAR*	Capital gearing ratio (*Datastream* item 731)	Positive
	PROFIT	1 if pre-tax profit (*Datastream* item 154) is positive, 0 otherwise	Negative
	ΔPBT	1 if pre-tax profit (*Datastream* item 154) is greater than previous period, 0 otherwise	Negative
	ETR	Corporation tax minus double tax relief plus overseas tax (*Datastream* items 160, 162 and 167 respectively), divided by pre-tax profit (*Datastream* item 154)	Positive
	PYTC	Adjustment to prior year tax charge (*Datastream* item 199) divided by maximum potential deferred tax provision (as gathered from copy financial statements)	Negative
	EQUITY	Equity issued for cash plus equity issued for acquisition (*Datastream* items 412 and 414 respectively), divided by market value of equity at start of period (*Datastream* item *MV*)	Positive
	AUD	1 if auditor from 'big six', 0 otherwise	Negative
	SIZE	Natural logarithm of end-of-period market value of equity (*Datastream* item *MV*)	Positive or negative
	ACTV	Amount of surplus ACT set off against the period's deferred tax provision as scaled by the maximum potential deferred tax provision (both as gathered from copy financial statements), given positive sign if firm has under-provided deferred tax, negative if firm has over-provided deferred tax	Positive
	UNCERT	Modulus of coefficient of variation in analysts' forecast earnings per share (source: I/B/E/S) during the twelve months preceding results disclosure, given positive sign if firm has under-provided deferred tax, negative if firm has over-provided deferred tax	Positive

Earnings targets. Aside reduction of a post-tax loss, firms may have other desired or target levels of earnings. For example, in order to demonstrate improved performance, the previous period's post-tax profit could be a desired minimum level, and the incentive to manage deferred tax might fall as pre-tax profit over the period increases.[24] The variable ΔPBT is defined as a binary variable to be 1 if current pre-tax profit[25] is greater than that in the previous period, 0 otherwise.

$H_1(C)$: *There is a negative (positive) association between the direction of annual change in pre-tax profit and the extent of any under- (over-) provision of deferred tax*

[25] *Datastream* item 154. The prior literature focuses on prior year post-tax profits as a potential earnings target. Since the focus of this paper, however, is on earnings management via an element of the tax charge, the empirical analysis uses prior year pre-tax profits in order to abstract from tax effects.

Effective tax rate. Managers may attempt to use the level of deferred tax provision to achieve a desired effective tax rate (ETR). Curtis (1995) reports anecdotal evidence that firms 'set the deferred tax provision so as to achieve a desired effective tax rate.' Under-providing deferred tax could be used to mitigate a high ETR,[26] or, if an ETR stable over time is desired, under- and over-provision of deferred tax could be used for adjustments. The variable ETR is defined as rate of taxation before deferred taxation and prior year adjustments, i.e., current year tax charge,[27] divided by pre-tax profit.[28]

$H_1(D)$: There is a positive (negative) association between ETR and the extent of any under- (over-) provision of deferred tax

Adjustment to prior year's tax charge. The level of deferred tax provision can be used to mitigate the effect of an adjustment to a prior year's tax charge. The current tax charge included in a profit and loss statement is an estimate and can differ significantly from the finally agreed liability. Where the agreed liability differs from the earlier recorded estimate firms frequently separately disclose the difference by way of an adjustment to the prior year tax charge.[29] Relative to earnings management via the profit before tax line, the use of the deferred tax provision to absorb 'tax shocks' in the form of prior year adjustment is low both in cost and risk. The (corporation) tax consequences are zero and the subjective nature of the partial provision method reduces the likelihood of detection and successful challenge by the auditor. Further, this treatment is less visible than adjusting through the current corporation tax charge – where auditors routinely compare the levels of provision with levels of subsequently agreed liabilities. The variable *PYTC* is defined as adjustment to prior year tax charge[30] scaled by the maximum potential deferred tax provision.[31]

$H_1(E)$: There is a positive (negative) association between the magnitude of any adjustment to increase a prior year tax charge and the extent of any under- (over-) provision of deferred tax; and vice-versa in respect of any adjustment to decrease a prior year tax charge

Issuance of equity. Having recently issued equity or intending to do so shortly, a firm may attempt to increase its after-tax profit through under-providing deferred tax. Firms which have recently issued shares may feel under pressure to report higher earnings (particularly if the issue was accompanied by a profit forecast); those intending to issue shares may seek to make the impending offer more attractive to potential investors by increasing the level of after-tax profits. The variable *EQUITY* is defined as the proceeds of share issues during a period of account[32] divided by the market value of equity capital at the start of that period of account.[33]

$H_1(F)$: There is a positive association between the issuance of equity and the extent of any under-provision of deferred tax

Auditor quality. Firms facing similar incentives to manage earnings may respond in different ways owing to variations in the potential penalties if any earnings management is detected. Although all firms in the sample are subject to the same legal and market reporting requirements, there is variation in the identity of their auditors. The auditing literature argues that audit quality, in terms of error detection and response, varies between different audit firms. Numerous studies, both theoretical and empirical, offer support that the largest audit firms provide superior quality (DeAngelo, 1981). To the extent that audits constrain earnings management, the employment of a higher quality auditor will reduce the level of both under- and over-provisioning. Antle and Nalebuff (1991) state that the penalties which auditors face for failing to detect or prohibit earnings overstatement are greater than those they face with earnings understatement. Empirical evidence confirms that auditors are more likely to be sued in relation to over-stating, rather than under-stating, earnings (St Pierre and Anderson, 1984). The variable *AUD* is defined as a binary variable to be 1 if the auditor was one of the (then) 'big six' firms, 0 otherwise.

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[26] Benchmarked, perhaps, against the statutory rate.

[27] Corporation tax (*Datastream* item 160) minus double tax relief (*Datastream* item 162) plus overseas tax (*Datastream* item 167).

[28] *Datastream* item 154.

[29] *Statement of Standard Accounting Practice 8: The treatment of taxation under the imputation system in the accounts of companies* (Accounting Standards Committee, adopted by the Accounting Standards Board, issued August 1974, amended October 1992) does not require the separate disclosure of prior year adjustments. As an intriguing aside, Appendix 3 (added December 1977, revised 1988), which applies to companies subject to taxation in the Republic of Ireland, does require that 'material adjustments in respect of previous periods should be disclosed' (para. 28).

[30] *Datastream* item 199. The prior year tax adjustment figure obtained from *Datastream* is an aggregate item and may, therefore, include a deferred tax component. In testing the hypothesis relating to prior year adjustments, the source of the increase (decrease) in the tax charge is unimportant. We hypothesise that the presence of a prior year adjustment will result in an offsetting deferred tax adjustment, i.e., an under- or over-provision.

[31] As gathered from copy financial statements.

[32] Equity issued for cash (*Datastream* item 412) plus equity issued for acquisition (*Datastream* item 414), both including any share premium.

[33] *Datastream* item *MV*.

$H_1(G)$: There is a negative association between auditor quality and the extent of any under-provision of deferred tax

Firm size. A firm's size may influence its willingness to manage earnings: large firms may have a higher political visibility and, therefore, have a greater incentive to reduce profitability in an attempt to reduce the likelihood and effect of political intervention (Watts and Zimmerman, 1978). Empirical studies of earnings management support this view (for example, Peasnell et al., 2000b). With specific regard to deferred tax, a counter-argument, based on anecdotal evidence, exists: in order to minimise compliance costs with SSAP15, small firms may provide in full thereby avoiding the exercise of estimating reversals. The variable *SIZE* is defined to be the natural logarithm of end-of-period market value of equity.[34]

$H_1(H)$: There is an association between firm size and the extent of any under- or over-provision of deferred tax

Advance corporation tax. The ultimate profit and loss effect of under- or over-providing deferred tax is dependent upon the amount of advance corporation tax (ACT) available to be set off against the provision. In the absence of surplus ACT, there is a direct pound-for-pound relationship between a change in the level of deferred tax provision and the resulting tax charge. When a firm has surplus ACT, however, the effect of under- or over-providing deferred tax may be 'dampened', since change in the level of deferred tax charge creates a proportional change in the maximum permissible ACT off-set. It is, therefore, necessary to control for ACT in testing the above hypotheses. The variable *ACTV* is defined to be the amount of surplus ACT set off against the period's deferred tax provision as scaled by the maximum potential deferred tax provision,[35] given positive sign for firms which under-provide deferred tax, and negative for those which over-provide deferred tax.

$H_1(I)$: There is a positive association between the existence of surplus ACT and the extent of any under- or over-provision of deferred tax.

Finally, as discussed above, in testing these hypotheses there must be a control for uncertainty in forecasting since the under- or over-providing for deferred tax may occur simply as a result of uncertainty and errors in forecasting events and not as a result of deliberate management induced bias. In formulating an appropriate control variable, it is important to attempt to reflect the difficulty which management face in making accurate forecasts, i.e., a measure of variability in expectations, rather than variability in outcomes, would seem best.

The initial control variable,[36] *UNCERT*, is defined to be the coefficient of variation in analysts' forecast earnings per share[37] for the year under review (following Baron and Stuerke, 1998), given positive sign for firms which under-provide deferred tax, and negative for those which over-provide deferred tax. The use of analysts' forecasts is motivated by the following link between capital expenditure and accounting earnings.

To the extent that capital markets are allocatively efficient, capital should be available to the potentially more profitable user in preference to the less profitable user. Consistent with this expectation, Welch and Wessels (2000) find that stock returns are a significant factor in explaining cross-sectional variation in levels of capital expenditure.[38] If accounting earnings and stock returns are linked, as suggested by an extensive empirical literature dating back to Ball and Brown (1968), then uncertainty over future accounting earnings transmit into uncertainty over stock returns, in turn implying uncertainty over levels of future capital expenditure. The exact nature of the relationship and the strength of the linkages will depend in part on the extent to which stock returns lead accounting earnings.

3.3. Data collection and sample selection

Ernst & Young (2001)[39] states that the forecast period projection for deferred tax calculation purposes '... will obviously become less reliable the further into the future it goes, and the period which may be forecast with a reasonable degree of accuracy may be no more than two years.'; and the original SSAP15 cited 'normally three years' concerning the forecasting period. The longer the forecasting period, ceteris paribus, the greater the opportunity to engage in un-penalised earnings management, given the greater the opportunity to disguise (or spuriously defend) such activity in terms of 'forecasting problems'. Therefore, it was desired to measure $PD_{t,x}$ with respect to a forecasting period, x, ranging from one year to four years. It was further desired to be able to perform analysis based on $PD_{t,x}$ at two successive year-ends. Thus, complete deferred tax data was required in respect of six successive years for each firm.

An initial sample of every one in three firms was drawn from the list of firms quoted on the London stock exchange as at 31 December 1992 (excluding financial firms), yielding 361 firms.[40] The need

[34] *Datastream* item *MV*.

[35] Both as gathered from copy financial statements.

[36] Subsequent sensitivity analysis employs two alternative control measures.

[37] As supplied by I/B/E/S.

[38] These authors also find change in levels of cash to be a significant factor.

[39] And earlier editions. Page 1,685 in the 2001 edition.

[40] Source of list of quoted firms: *Quality of Markets; Companies Book 1992*, published by The International Stock Exchange of the United Kingdom and the Republic of Ireland, London.

Table 2
Sample selection and screening process (number of firms)

One in three firms quoted on the LSE as at 31 December 1992		361
Of which, copy 1992 financial statements provided		316
Of which, copy financial statements 1993–1996 provided (initial sample)		**147**
Less firms with: (i) tax on rolled-over or held-over chargeable gains; (ii) tax on potential remittances of overseas income; or (iii) trading losses or surplus ACT in excess of the maximum amounts offsetable	(65)	
Less firms which provided deferred tax in full	(24)	
Final sample		**58**

to obtain six years of data required an earlier rather than a later start date. The years 1990 and 1991 were chosen because these were both years of relatively poor economic conditions. 1990 was the only year in the decade to experience a real fall in GDP (–1.20%), while 1991 experienced the lowest increase in GDP for the same period (0.002%). The likelihood of earnings management was considered to be higher under such conditions. In the absence of the required deferred tax information being available in a machine-readable form, a request for a copy of the 1992 financial statements was made of each of these 361 selected firms. Financial statements were received from 316 firms, and in the four subsequent years a similar request were made to each of these 316. The result was an initial sample of 147 firms, for which complete deferred tax data for the two periods 1991–1995 and 1992–1996 had been collected.[41]

A screening process then removed all firms that had provided in respect of any of the following deferred tax items in either 1991 or 1992: (i) tax on rolled-over or held-over chargeable gains; (ii) tax on potential remittances of overseas income; or (iii) trading losses or surplus ACT in excess of the maximum amounts offsetable.[42] The result was to produce a sample of 82 firms with deferred tax liabilities relating only to the following items: capital allowances and other short term timing differences, trading losses and ACT. The final step was to exclude those firms which had provided deferred tax in full in either of 1991 or 1992, or which had maximum potential deferred tax asset balances. The final sample consisted of 58 firms. The sample selection and screening process is summarised in Table 2.

3.4. Empirical models

The following model was estimated for $t = 1991$ and 1992:

$$\overline{PD}_{t,4} = \alpha_t + \beta_{1,t}GEAR_t + \beta_{2,t}PROFIT_t + \beta_{3,t}\Delta PBT_t + \beta_{4,t}ETR_t + \beta_{5,t}PYTC_t + \beta_{6,t}EQUITY_t + \beta_{7,t}AUD_t + \beta_{8,t}SIZE_t + \beta_{9,t}ACTV_t + \beta_{10,t}UNCERT_t + \varepsilon_t \quad (6)$$

In this model, to be termed the 'aggregated model', the dependent variable is the aggregated variable as defined in expression (4), with x = 4, i.e., the mean of four under / overprovision variables, as calculated according to expression (3) assuming a one-year, a two-year, a three-year and a four-year forecasting period.

The following model was estimated for $t = 1991$ and 1992, and for forecasting period one year, two years, three years and four years:

$$PD_{t,x} = \alpha_t + \beta_{1,t}GEAR_t + \beta_{2,t}PROFIT_t + \beta_{3,t}\Delta PBT_t + \beta_{4,t}ETR_t + \beta_{5,t}PYTC_t + \beta_{6,t}EQUITY_t + \beta_{7,t}AUD_t + \beta_{8,t}SIZE_t + \beta_{9,t}ACTV_t + \beta_{10,t}UNCERT_t + \varepsilon_t \quad (7)$$

In this model, to be termed the 'disaggregated model', the dependent variable is as defined in expression (3), with x being, successively (for each of 1991 and 1992) one year, two years, three years and four years.

In each case, the α are model-specific intercepts; the β are model-specific slope coefficients; and the ε are model-specific stochastic error terms.

In all cases the models were estimated using ordinary least squares estimation, and also, for reasons explained in the next section, using two alternative 'robust' estimators (being an iteratively re-weighted least squares (IRLS) estimator and a bounded influence estimator). The estimations were performed on *SHAZAM Professional Edition* Version 9.0 (2001) and *STATA INTERCOOLED* Version 7.0 (2001).

[41] The reduction to 147 firms was due to take-overs, failures and other de-listing events, and to changes at the firm level in the form of disclosure that rendered the data incompatible over time in a number of cases.

[42] This screening was necessary owing both to the methodological assumption set out in an earlier section, and to inconsistency in disclosure relating to the screened items.

Table 3
Non-parametric correlation between alternative formulations of the dependent variable
Spearman's *rho*; $N = 58$ (all significant at the 1% level, one-tailed test)

Table 3.1 – 1991

	$\overline{PD}_{1991,4}$	$PD_{1991,1}$	$PD_{1991,2}$	$PD_{1991,3}$	$PD_{1991,4}$
$\overline{PD}_{1991,4}$	1.000	0.871	0.931	0.932	0.922
$PD_{1991,1}$		1.000	0.862	0.749	0.703
$PD_{1991,2}$			1.000	0.868	0.834
$PD_{1991,3}$				1.000	0.902
$PD_{1991,4}$					1.000

Table 3.2 – 1992

	$\overline{PD}_{1992,4}$	$PD_{1992,1}$	$PD_{1992,2}$	$PD_{1992,3}$	$PD_{1992,4}$
$\overline{PD}_{1992,4}$	1.000	0.851	0.935	0.977	0.939
$PD_{1992,1}$		1.000	0.797	0.779	0.745
$PD_{1992,2}$			1.000	0.911	0.866
$PD_{1992,3}$				1.000	0.915
$PD_{1992,4}$					1.000

Variables:
$PD_{t,x}$ – Under (over) provision of deferred tax in year t as a proportion of the maximum potential deferred tax provision in year t, assuming a forecasting period for deferred tax purposes of x years. Five alternative formulations: $x = 1, 2, 3$ and 4; and an aggregate formulation, being the arithmetic mean of the variable under the other formulations.

4. Results

4.1. Descriptive statistics and univariate analyses

The correlations between $\overline{PD}_{1991,4}$, $PD_{1991,1}$, $PD_{1991,2}$, $PD_{1991,3}$ and $PD_{1991,4}$ are set out in Table 3. Given the high levels of skewness and / or kurtosis present in some of the variables, the reported pair-wise correlations are based upon a non-parametric measure (Spearman's *rho*).[43] As anticipated, the alternative formulations of the dependent variable are highly correlated. Similarly for the 1992 dependent variable. Table 4 shows summary statistics upon the variables, and Table 5 the pair-wise correlations coefficients for the continuous variables. In each table, 1991 and 1992 statistics are shown separately. The negative relationship between market value and variation in analysts' forecasts supports the use of the latter variable as a proxy for uncertainty. Fama and French's (1992) results were interpreted as indicating that firm risk decreases with firm size, a result consistent with the above relationship. To the extent that the degree of variation in analysts' forecasts is a function of the number of analysts making forecasts, then the inclusion of a size variable in our model has the additional effect of controlling for the positive relationship between firm size and number of analysts. The correlation analysis suggests that potentially high levels of multicollinearity should not be a feature of the data set (and subsequent multivariate analysis using condition indices supports this contention). The absence in either 1991 or 1992 of a significant correlation coefficient between the absolute value of the dependent variable and the uncertainty control variable, coefficient of variation in analyst's forecasts, is addressed in the discussion of the multivariate results and is subject to robustness tests.

In both years, the majority of firms over-provide deferred tax (43 in 1991 and 42 in 1992). Table 6 summarises levels of under and over-provisioning for the sample. In interpreting the table and the following commentary, it is important to appreciate that the unbracketed figures represent the mean income effect before the dampening effect of any write off or write back of ACT,[44] while the bracketed amounts represent the corresponding values for the sample excluding all firms with surplus ACT. The mean amount of under-provision by the 15 (9) and 16 (9) under-providing firms 1991 and 1992 is £0.4m (£0.5m) and £0.7m (£0.8m) respectively. This represents 20.6% (22.1%) and 21.5% (23.0%) respectively of the related mean maximum potential deferred tax liabilities of £1.9m (£2.2m) and £3.2m (£3.3m). Among the over-providing firms, the mean amount over-provided in 1991 and 1992 amounted to £4.1m (£4.4m) and

[43] The issue of non-normality in a multivariate setting is addressed later in the paper.

[44] The impact (if any) of ACT is firm specific and, whilst in a multivariate setting the level of ACT set off is included as an explanatory variable, in an analysis of the aggregate level of under- and over-provision it is not possible to adjust for the impact of ACT. In order to do so, identification of individual firms' ACT capacity – requiring a division between UK and non-UK taxable profits – would be necessary.

Table 4
Summary statistics upon variables (N=58 for each variable in each year)

		Minimum	*Maximum*	*Mean*	*SD*	*Skewness*	*Kurtosis*
1991							
Alternative formulations of the dependent variable	$\overline{PD}_{1991,4}$	–86.10	65.47	–15.17	35.62	–0.07	–0.19
	$PD_{1991,1}$	–84.99	97.24	–21.08	36.05	0.32	0.88
	$PD_{1991,2}$	–100.00	72.73	–18.13	35.35	–0.10	0.29
	$PD_{1991,3}$	–80.89	94.84	–12.92	37.53	0.45	0.58
	$PD_{1991,4}$	–100.00	100.00	–8.53	45.53	0.38	0.09
Independent variables	*GEAR*	0.00	126.20	29.92	20.09	1.88	7.99
	PROFIT	0.00	1.00	0.90			
	ΔPBT	0.00	1.00	0.47			
	ETR	0.00	0.50	0.28	0.11	–0.78	1.01
	PYTC	–0.25	1.97	0.10	0.30	4.58	25.65
	EQUITY	0.00	0.64	0.06	0.14	2.95	9.14
	AUD	0.00	1.00	0.76			
	SIZE	1.31	9.10	4.45 [a,b]	1.65	0.35	0.03
	ACTV[c]	0.00	0.62	0.09	0.15	1.96	3.53
	UNCERT[c]	0.00	96.84	17.28	21.06	2.37	5.64
1992							
Alternative formulations of the dependent variable	$\overline{PD}_{1992,4}$	–100.00	85.29	–16.02	40.24	0.26	–0.10
	$PD_{1992,1}$	–100.00	76.47	–24.00	36.97	0.28	0.00
	$PD_{1992,2}$	–100.00	100.00	–16.48	41.24	0.60	0.63
	$PD_{1992,3}$	–100.00	100.00	–11.82	49.01	0.53	–0.23
	$PD_{1992,4}$	–100.00	100.00	–11.77	45.70	0.57	0.44
Independent variables	*GEAR*	0.00	123.75	29.42	21.65	1.59	5.13
	PROFIT	0.00	1.00	0.88			
	ΔPBT	0.00	1.00	0.52			
	ETR	–0.90	0.54	0.23	0.19	–3.64	20.77
	PYTC	–0.12	3.09	0.16	0.47	5.01	28.59
	EQUITY	0.00	0.37	0.03	0.07	2.96	9.06
	AUD	0.00	1.00	0.76			
	SIZE	1.58	9.17	4.64 [a,b]	1.59	0.25	0.11
	ACTV[c]	0.00	0.70	0.10	0.15	2.03	4.90
	UNCERT[c]	0.00	138.83	15.79	25.05	3.85	15.59

Notes:
[a] difference between 1991 and 1992 distributions significant at 1% level (Wilcoxon signed rank test)
[b] difference in means between 1991 and 1992 significant at 1% level (t-test)
[c] summary statistics upon the absolute values of *ACTV* and *UNCERT*

Variables (see Table 1 for full description):
PD – Under (over) provision of deferred tax, scaled by maximum potential deferred tax provision; *GEAR* – capital gearing ratio; *PROFIT* – binary variable based on pre-tax profit (1 if positive, 0 otherwise); *ΔPBT* – binary variable based on change in pre-tax profit (1 if increase, 0 otherwise); *ETR* – effective tax rate; *PYTC* – adjustment to prior year tax charge, scaled by maximum potential deferred tax provision; *EQUITY* – equity issued scaled by market value; *AUD* – binary variable based on identity of auditor (1 if 'big 6', 0 otherwise); *SIZE* – natural logarithm of market value; *ACTV* – surplus ACT set off against deferred tax provision, scaled by maximum potential deferred tax provision; and *UNCERT* – modulus of coefficient of variation in analysts' EPS forecasts.

Table 5
Pair-wise correlation coefficients between variables: Spearman's *rho*
5%, 2.5% and 1% levels of significance denoted by *, ** and *** respectively; one or two-tailed tests as appropriate; reported correlation coefficients between the dependent variable and each of *ACTV* and *UNCERT* are as calculated using the absolute value of each of these, since ACT and uncertainty each contribute to both under- and over-provisioning

Table 5.1 – 1991

	$\overline{PD}_{1991,4}$	*GEAR*	*ETR*	*PYTC*	*EQUITY*	*SIZE*	*ACTV*	*UNCERT*
$\overline{PD}_{1991,4}$	1.00	0.15	0.02	–0.02	–0.10	–0.17	0.29 **	0.07
GEAR		1.00	0.00	0.23	–0.07	0.05	0.32 ***	0.17
ETR			1.00	0.19	0.13	–0.18	0.02	0.05
PYTC				1.00	–0.12	–0.24	0.07	–0.07
EQUITY					1.00	–0.12	–0.14	0.28 *
SIZE						1.00	–0.11	–0.39 ***
ACTV							1.00	0.42 ***
UNCERT								1.00

Table 5.2 – 1992

	$\overline{PD}_{1992,4}$	*GEAR*	*ETR*	*PYTC*	*EQUITY*	*SIZE*	*ACTV*	*UNCERT*
$\overline{PD}_{1992,4}$	1.00	0.11	–0.03	0.14	–0.36 ***	–0.17	0.24 *	0.10
GEAR		1.00	–0.22	0.20	–0.23	0.10	–0.03	0.09
ETR			1.00	0.30 **	0.13	–0.13	–0.01	0.08
PYTC				1.00	–0.13	–0.25	0.18	0.26 *
EQUITY					1.00	0.08	–0.09	–0.12
SIZE						1.00	–0.01	–0.20
ACTV							1.00	0.43 ***
UNCERT								1.00

Variables (see Table 1 for full description):
PD – Under (over) provision of deferred tax, scaled by maximum potential deferred tax provision; *GEAR* – capital gearing ratio; *PROFIT* – binary variable based on pre-tax profit (1 if positive, 0 otherwise); *ΔPBT* – binary variable based on change in pre-tax profit (1 if increase, 0 otherwise); *ETR* – effective tax rate; *PYTC* – adjustment to prior year tax charge, scaled by maximum potential deferred tax provision; *EQUITY* – equity issued scaled by market value; *AUD* – binary variable based on identity of auditor (1 if 'big 6', 0 otherwise); *SIZE* – natural logarithm of market value; *ACTV* – surplus ACT set off against deferred tax provision, scaled by maximum potential deferred tax provision; and *UNCERT* – modulus of coefficient of variation in analysts' EPS forecasts.

£4.3m (£5.0m) respectively, by the 43 (23) and 42 (20) firms concerned. These amounts represent 19.61% (14.0%) and 21.5% (23.0%) of the mean maximum potential deferred tax liabilities of £20.8m (£31.0m) and £21.9m (£36.3m) in the two years. An alternative view of the level of under-/over-providing is by reference to mean level of profits. The level of over-provision represented 8.9% (9.4%) and 8% (5.6%) of the net profit before tax for 1991 and 1992 respectively. The percentages for the under-providing firms were 8.7% (9.3%) and 51.9% (66.7%). On average, the levels of under- and over-provision are significant in an economic sense when measured against both the maximum potential deferred tax provision and, more importantly, the level of pre-tax profit. The preponderance of over-providing might represent firms generally under estimating future levels of capital expenditure. Independent of earnings management, this could result if firms were unduly pessimistic about the state of the economy during the forecast period.[45] In the absence of individual firm planned and actual capital expenditure levels

[45] We thank a referee for suggesting this possible explanation.

[46] An analysis of GDP forecasts and realised outcomes could give an indication to the degree of unexpectedness in changes in the level of GDP during the forecast periods. Using data published by the National Institute of Economic and Social Research in the *National Institute Economic Review* (various years) the realised levels of real GDP in 1992, 1993, 1994 and 1995 are similar to, although consistently lower than, the levels for each of those years as forecast in 1991 (actual from index base of 100: 100.07, 102.38, 106.92 and 109.85; and forecast: 102.1, 104.65, 107.48 and 110.49 respectively). In contrast, the forecasts made in 1992 are consistently exceeded by the realised levels (actual: 102.31, 106.84, 109.77 and 112.62; and forecast: 102.0, 104.55, 106.64 and 108.56). This difference in the accuracy of the 1991 and 1992 based GDP forecasts is not, however, apparent in a material increase in the frequency or level of over providing in 1992 relative to 1991 (see Table 6).

Table 6
Comparison of mean levels of under- and over-providing with level of maximum potential deferred tax and profit before tax
(bracketed figures relate to the sub-sample of firms without surplus ACT)

	Number	*Over provision (£000s)*	*Under provision (£000s)*	*Maximum potential (£000s)*	*Over / under provision as % of maximum potential*	*Profit before tax (£000s)*	*Over / under provision as % of profit before tax*
1991							
Under-providers	15		400	1,943	20.6%	4,577	8.7%
	(9)		(485)	(2,191)	(22.1%)	(5,241)	(9.3%)
Over-providers	43	4,070		20,814	19.6%	45,953	8.9%
	(23)	(4,352)		(30,994)	(14.0%)	(46,190)	(9.4%)
1992							
Under-providers	16		685	3,182	21.5%	1,319	51.9%
	(9)		(763)	(3,276)	(23.0%)	(1,144)	(66.7%)
Over-providers	42	4,334		21,889	19.8%	54,310	8.0%
	(20)	(4,963)		(36,286)	(13.7%)	(89,353)	(5.6%)

Table 7
OLS and robust multivariate regression results
(5%, 2.5% and 1% levels of significance denoted by *, ** and *** respectively; one or two-tailed tests as appropriate)

Table 7.1 – 1991

$$PD_t = \alpha_1 + \beta_{1,t}GEAR_t + \beta_{2,t}PROFIT_t + \beta_{3,t}\Delta PBT_t + \beta_{4,t}ETR_t + \beta_{5,t}PYTC_t + \beta_{6,t}EQUITY_t + \beta_{7,t}AUD_t + \beta_{8,t}SIZE_t + \beta_{9,t}ACTV_t + \beta_{10,t}UNCERT_t + \varepsilon_t$$

t = 1991; five different formulations of the dependent variable (see Table 1 and Section 3.1)

	OLS					Robust				
Dependent variable	$\overline{PD}_{1991,4}$	$PD_{1991,1}$	$PD_{1991,2}$	$PD_{1991,3}$	$PD_{1991,4}$	$\overline{PD}_{1992,4}$	$PD_{1992,1}$	$PD_{1992,2}$	$PD_{1992,3}$	$PD_{1992,4}$
GEAR	0.268	–0.076	0.248	0.452	0.279	0.256	0.025	0.181	0.509	0.309
	(1.381)	(–0.312)	(1.202)	(2.441***)	(1.657)	(1.22)	(0.10)	(0.96)	(2.41***)	(1.63)
PROFIT	–50.450	–40.319	–24.476	–31.006	–55.580	–50.767	–38.499	–34.416	–41.529	–53.699
	(–3.445***)	(–2.578***)	(–1.820*)	(–2.002*)	(–4.541***)	(–3.27***)	(–2.39**)	(–2.75***)	(–2.69***)	(–3.83***)
ΔPBT	7.079	6.657	5.499	6.121	3.464	6.157	4.989	14.337	4.339	3.115
	(0.958)	(0.754)	(0.717)	(0.970)	(0.538)	(0.76)	(0.55)	(2.05*)	(0.51)	(0.43)
ETR	–1.6178	–10.522	14.228	18.649	12.756	7.286	–18.822	32.1671	28.334	20.367
	(–0.049)	(–0.253)	(0.418)	(0.652)	(0.433)	(0.20)	(–0.44)	(1.01)	(0.73)	(0.60)
PYTC	–37.036	–32.229	–43.931	–30.756	–50.073	–39.823	–35.948	–48.567	–32.308	–51.746
	(–3.478***)	(–2.446***)	(–4.027***)	(–5.117***)	(–5.381***)	(–3.41***)	(–2.65***)	(–4.79***)	(–2.74***)	(–4.87***)
EQUITY	–54.949	9.402	3.446	–16.461	–81.817	–55.631	–8.1315	60.378	–31.692	–87.131
	(–2.084**)	(0.289)	(0.131)	(–0.507)	(–3.535***)	(–1.98*)	(–0.24)	(2.46***)	(–1.06)	(–3.29***)
AUD	–0.048	–2.662	–5.528	–4.824	2.102	–3.465	–16.983	–13.640	–4.999	4.261
	(–0.006)	(–0.274)	(–0.638)	(–0.594)	(0.278)	(–0.41)	(–1.70*)	(–1.80*)	(–0.56)	(0.52)
SIZE	–0.797	1.709	0.165	–1.745	–1.568	–1.215	0.311	–0.266	–2.762	–1.849
	(–0.399)	(0.692)	(0.081)	(–0.912)	(–0.905)	(–0.56)	(0.12)	(–0.14)	(–1.23)	(–0.93)
ACTV	93.081	63.797	87.730	106.48	119.59	102.536	82.374	76.6935	117.418	118.031
	(4.757***)	(2.404***)	(4.426***)	(5.984***)	(6.883***)	(4.83***)	(3.02***)	(4.16***)	(4.98***)	(5.93***)
UNCERT	0.365	0.426	0.291	0.343	0.696	0.319	0.323	–0.049	0.402	0.699
	(2.475***)	(2.657***)	(2.044**)	(3.216***)	(5.719***)	(1.97*)	(1.96*)	(–0.37)	(2.73**)	(5.02***)
Constant, α	37.282	20.265	5.167	17.704	49.893	43.959	41.7423	14.229	33.253	46.897
	(2.263*)	(1.040)	(0.319)	(0.880)	(3.522***)	(2.54)	(2.08*)	(0.95)	(1.90)	(2.91***)

Table 7.1 – 1991 (continued)

	OLS					Robust				
Dependent variable	$\overline{PD}_{1991,4}$	$PD_{1991,1}$	$PD_{1991,2}$	$PD_{1991,3}$	$PD_{1991,4}$	$\overline{PD}_{1992,4}$	$PD_{1992,1}$	$PD_{1992,2}$	$PD_{1992,3}$	$PD_{1992,4}$
N	56	58	56	57	56	58	58	58	58	58
Jarque-Bera $\sim\chi^2(2)$	4.849	1.786	4.492	4.226	2.402					
Breusch-Pagan $\sim\chi^2(10)$	10.829	5.728	9.041	20.586**	7.682					
RESET	0.001 (1,44)	0.075 (1,46)	0.001 (1,44)	0.420 (1,45)	0.165 (1,44)					
R^2	0.592	0.386	0.527	0.516	0.791					
F-test	8.965*** (10,45)	4.586*** (10,47)	7.122*** (10,45)	6.978*** (10,46)	21.765*** (10,45)	9.30*** (10,47)	4.87*** (10,47)	7.85*** (10,47)	9.30*** (10,47)	16.29*** (10,47)

Variables (see Table 1 for full description):
PD – Under (over) provision of deferred tax, scaled by maximum potential deferred tax provision; *GEAR* – capital gearing ratio; *PROFIT* – binary variable based on pre-tax profit (1 if positive, 0 otherwise); ΔPBT – binary variable based on change in pre-tax profit (1 if increase, 0 otherwise); *ETR* – effective tax rate; *PYTC* – adjustment to prior year tax charge, scaled by maximum potential deferred tax provision; *EQUITY* – equity issued scaled by market value; *AUD* – binary variable based on identity of auditor (1 if 'big 6', 0 otherwise); *SIZE* – natural logarithm of market value; *ACTV* – surplus ACT set off against deferred tax provision, scaled by maximum potential deferred tax provision; and *UNCERT* – modulus of coefficient of variation in analysts' EPS forecasts.

Table 7 (continued)

Table 7.2 – 1992
(variable definitions as per Table 7.1)

$$PD_t = \alpha_1 + \beta_{1,t}GEAR_t + \beta_{2,t}PROFIT_t + \beta_{3,t}\Delta PBT_t + \beta_{4,t}ETR_t + \beta_{5,t}PYTC_t + \beta_{6,t}EQUITY_t + \beta_{7,t}AUD_t + \beta_{8,t}SIZE_t + \beta_{9,t}ACTV_t + \beta_{10,t}UNCERT_t + \varepsilon_t$$

t = 1992; five different formulations of the dependent variable (see Table 1 and Section 3.1)

	OLS					Robust				
Dependent variable	$\overline{PD}_{1992,4}$	$PD_{1992,1}$	$PD_{1992,2}$	$PD_{1992,3}$	$PD_{1992,4}$	$\overline{PD}_{1992,4}$	$PD_{1992,1}$	$PD_{1992,2}$	$PD_{1992,3}$	$PD_{1992,4}$
GEAR	0.319	0.238	0.319	0.481	0.089	0.329	0.209	0.412	0.339	0.011
	(1.451)	(1.075)	(1.512)	(1.872*)	(0.390)	(1.44)	(0.91)	(1.79*)	(1.32)	(0.04)
PROFIT	–22.064	1.156	–35.496	–32.644	–62.436	–16.391	–0.682	–35.800	–39.378	–36.016
	(–1.286)	(0.067)	(–2.178**)	(–1.633)	(–3.502***)	(–0.93)	(–0.04)	(–2.08**)	(–1.96*)	(–1.93*)
ΔPBT	–1.766	–6.211	–14.022	–4.537	–6.694	–1.134	–7.345	–11.726	–11.360	–9.188
	(–0.194)	(–0.664)	(–1.577)	(–0.425)	(–0.703)	(–0.12)	(–0.76)	(–1.24)	(–1.06)	(–0.92)
ETR	28.009	9.697	46.910	33.941	56.936	25.478	12.555	44.405	54.941	34.688
	(0.995)	(0.344)	(1.740*)	(1.032)	(1.942*)	(0.87)	(0.43)	(1.57)	(1.66)	(1.13)
PYTC	–23.352	–23.819	–21.218	–28.920	–29.992	–17.463	–22.091	–52.086	–27.503	–24.845
	(–2.594***)	(–2.628***)	(–2.465***)	(–2.753***)	(–3.204***)	(–1.87*)	(–2.36***)	(–2.89***)	(–2.60***)	(–2.53***)
EQUITY	–22.337	–18.478	–37.518	–58.888	–0.385	–48.148	–27.018	–44.707	–36.034	–7.740
	(–0.389)	(–0.319)	(–0.683)	(–0.877)	(–0.006)	(–0.81)	(–0.45)	(–0.77)	(–0.53)	(–0.12)
AUD	2.872	–1.873	–4.423	–3.883	4.313	–8.942	–8.114	–3.705	4.489	–0.110
	(0.274)	(–0.178)	(–0.443)	(–0.318)	(0.395)	(–0.82)	(–0.74)	(–0.35)	(0.37)	(–0.01)
SIZE	–2.636	–2.558	–3.649	–5.052	–1.441	–4.190	–2.877	–4.443	–3.389	–0.981
	(–0.961)	(–0.929)	(–1.391)	(–1.573)	(–0.508)	(–1.47)	(–1.01)	(–1.59)	(–1.05)	(–0.33)
ACTV	80.967	101.81	155.68	149.35	122.82	122.678	107.773	136.597	142.159	115.538
	(3.951***)	(3.887***)	(5.857***)	(5.024***)	(4.816***)	(4.65***)	(3.98***)	(4.84***)	(5.05***)	(4.32***)
UNCERT	0.326	0.409	0.314	0.403	0.404	0.449	0.406	0.322	0.358	0.437
	(3.197***)	(2.694***)	(2.178**)	(2.321***)	(2.603***)	(2.93***)	(2.58***)	(2.13***)	(2.05**)	(2.68***)
Constant, α	6.847	–2.457	41.847	41.687	47.9480	30.484	11.095	43.548	34.013	34.623
	(0.357)	(–0.122)	(2.248*)	(1.866)	(2.397**)	(1.54)	(0.53)	(2.22)	(1.51)	(1.65)

Table 7.2 – 1992 (continued)

	OLS					Robust				
Dependent variable	$\overline{PD}_{1992,4}$	$PD_{1992,1}$	$PD_{1992,2}$	$PD_{1992,3}$	$PD_{1992,4}$	$\overline{PD}_{1992,4}$	$PD_{1992,1}$	$PD_{1992,2}$	$PD_{1992,3}$	$PD_{1992,4}$
N	58	58	58	58	58	58	58	57[note]	58	58
Jarque-Bera $\sim\chi^2(2)$	2.016	4.771	1.232	1.412	1.348					
Breusch-Pagan $\sim\chi^2(10)$	12.808	3.663	10.158	16.296	12.703					
RESET	2.125 (1,46)	6.82** (1,46)	2.976 (1,46)	0.193 (1,46)	0.075 (1,46)					
R^2	0.442	0.328	0.513	0.486	0.531					
F-test	5.513*** (10,47)	3.782*** (10,47)	6.997*** (10,47)	6.395*** (10,47)	7.454*** (10,47)	6.23*** (10,47)	3.74*** (10,47)	6.23*** (10,46)	5.70*** (10,47)	5.13*** (10,47)

Note: The sample size is reduced to 57 because an initial step of the IRLS procedure is to calculate the Cook's statistic for all observations and exclude those which are deemed to be overly influential (i.e., for which the Cook's statistic is more than one).

for each year in the forecasting period, it is not possible to control for the degree of under/over-provision attributable to unexpected levels of economic growth. Analysis of forecast and realised levels of GDP suggests that any tendency to under estimate future levels of capital expenditure does not derive from uncertainty over the general level of economic activity.[46] Such a broad analysis cannot rule out firm or industry specific factors.

Cross-tabulation analyses (not reported) suggests that there is no relationship between audit firm quality and the level and/or frequency of under-/over-provision in either 1991 or 1992.[47] Similarly, no significant differences are found when comparing the level and frequency of under-provision and over-provision between firms reporting an increase in profits as against those reporting a loss, or between those issuing equity versus non-issuers.

In order to assess the potential influence of analysts' forecasts on the level of earnings management, an analysis was performed on a sample comprising firms without surplus ACT. Of the 33 such firms in 1991, 11 reported earnings per share in excess of the mean analysts' forecast. In 1992, eight out of 30 such firms similarly exceeded expectations. In the absence of under-providing, four of those firms would have failed to the forecast in 1991, and two firms would similarly have failed in 1992. There is, therefore, some evidence that some of the firms exceeded the analysts' expectations by under providing. This finding, however, must be qualified by the absence of a general relationship between the level of under- /over-provision on a per share basis and the difference between reported EPS and mean analyst forecast EPS (results not reported).

4.2. Multivariate results

Table 7 sets out the results of estimation of the aggregated model (6) and the disaggregated models (7) using both OLS and IRLS robust estimators.[48] Table 7.1 covers 1991, and Table 7.2 1992.

Initial OLS estimations using the full sample of 58 firms suffered from significant levels of non-normality in the distribution of the residuals for 1991.[49] Consequently, the reported OLS results are based on an iterative process designed to result in estimated models which do not appear to violate the assumption of normality in the residuals: the observation associated with the largest absolute residual was removed, the model re-estimated, and so forth until the Jarque-Bera statistic ceased to be significant at the 5% level. For the aggregated model, this process resulted in the removal of two firms for 1991 (none for 1992).

Additional diagnostic tests were performed, assessing multicollinearity, and testing for the presence of model misspecification, heteroskedasticity and influential observations. The level of multicollinearity amongst the independent variables appears to be acceptable: in all cases, the highest condition index for each set of independent variables is less than the suggested critical level of 10 (Belsley et al., 1980).[50] The Ramsey reset test was employed in order to assess model misspecification. Test statistics based on squared, cubed and fourth power transformations were estimated, although, in the interests of economy, only those based on the squared transformation are reported in Table 7. The test statistics are not significant at the 5% level, with the exception of the 1991 disaggregated model using a three-year forecast horizon, the 1992 aggregated model, and the 1992 disaggregated model using a one-year forecast horizon.[51] Overall, therefore, there is little evidence to suggest the models are mis-specified. The degree of heteroskedasticity was assessed using the Breusch-Pagan test. With the exception of the 1991 disaggregated model based on a three-year horizon, the test statistics were not significant at the 5% level. In the exceptional case, the reported t-statistics are corrected using the White (1980) adjustment.[52]

Analysis of the aggregated OLS models based on the sample of 58 firms identified a number of observations as being 'influential' using the DFITS criteria (Belsley et al., 1980).[53] The combination of non-normality and influential observations is an appropriate setting in which to employ robust estimation techniques. Two such techniques were employed: an iteratively re-weighted least

[47] In each of 1991 and 1992, 76% of sample firms were audited by 'big 6' audit firms.

[48] In the interests of economy, the results from only one of the robust estimators employed are reported – those from IRLS. The results of the bounded-influence estimator indicate that the reported OLS results are not driven by the presence of influential observations (see subsequent discussion). All the significant coefficients reported under the OLS estimations retain their statistical significance under bounded influence estimation, with two exceptions – those being *GEAR* in the 1991 estimation of the disaggregated model using a three year forecasting period, and *EQUITY* in the 1991 estimation of the aggregated model. The discussion of results in Section 4.2 is restricted to reporting upon and comparing the results of OLS and IRLS estimation.

[49] As indicated by a Jarque-Bera test statistic of 7.098 for the 1991 aggregated model.

[50] Indeed, the highest condition index had values 2.924 (1991) and 2.814 (1992).

[51] Where the F statistic values are 6.196 (3, 43), 4.312 (3, 44) and 5.214 (1,46) respectively, all significant at the 1% level.

[52] Although the Breusch-Pagan (1979) test is a large sample test and when used on 'small samples' can be 'liberal', the largest test statistic, with the exception of the three referred to above is, 11.385 (10 d.f.) – significant at 32%. Any liberal tendencies of the test in a small sample test would, therefore, not appear to be sufficient to change the conclusion that the level of heteroskedasticity is not serious.

[53] In 1991 and 1992, nine and two observations respectively had absolute values of the DFITS statistic in excess of the critical value of 0.816 – the critical value being determined as $2 \times \sqrt{p/n}$, where p = number of regressors and n = number of observations (Belsley et al., 1980).

squares (IRLS) estimator (Hamilton, 1991); and a bounded-influence estimator (Goldstein, 1991). The IRLS estimator is less sensitive than OLS to violations of the normality assumption arising from influential or outlying observations of the dependent variable, whilst the bounded-influence estimator has the effect of reducing the impact of outlying or influential observations of the independent variables.

In the aggregated models, the profit coefficient is of the hypothesised negative sign in both 1991 and 1992 and, although statistically significant at the 1% level in 1991, it is marginally insignificant in 1992. In the sets of disaggregated models, however, the coefficient is significant in all cases for 1991, and in two (three when using IRLS estimation) of the four cases in 1992. The relationship is consistent with a smoothing process: income-increasing (-reducing) earnings management is associated with a pre-tax loss (profit).[54] An alternative explanation, which cannot be discounted, is that, relative to profit making firms, loss-making firms systematically over forecast future levels of capital expenditure when determining the required level of deferred tax provision.

A similar smoothing process seen to be associated with the level of adjustments to prior year tax charges. Decreases (increases) in income resulting from such adjustments are associated with income-increasing (-decreasing) earnings management. The relationship is consistent across both years. In the aggregated models, the coefficient is of the hypothesised negative sign in both 1991 and 1992, statistically significant at the 1% level. When estimated in the disaggregated models, the coefficient is significant at the 1% level in all four cases in 1991 all of the four cases in 1992. This relationship is consistent with firms which anticipate a future potential adjustment to prior year tax, in particular an additional charge, incorporating its likely effect in the current year's deferred tax charge. The incentive in so doing is to avoid recording explicitly the likely adjustment as a tax charge adjustment, since this could weaken the firm's negotiating position with the tax authorities. If a liability is subsequently determined, then it is recorded in the tax charge, and a corresponding transfer made from the deferred tax provision – resulting in a zero net effect in the tax charge of the period in which the final liability is agreed.

There is weak evidence of a relationship between earnings management and the level of gearing. In the aggregated models the relationship is consistently positive as hypothesised – though not statistically significant in either 1991 or 1992. In the disaggregated models the coefficient is significant at the 1% level in one case out of four in both 1991 and 1992.

There is no evidence of a systematic relationship between the direction of annual change in profit and the dependent variable in the aggregated models. In the disaggregated models, the relevant coefficient is statistically significant in only one instance (in 1991), and generally lacks consistency as concerns the direction of any association. The coefficient is positive in all four cases in 1991, and negative in all four cases in 1992.

The effective tax rate variable coefficient is generally of the hypothesised positive sign. The only occurrences of a negative sign are in the aggregated model and one of the disaggregated models for 1991. In two cases in 1992 the coefficient is statistically significant (both at the 5% level), lending some support to the hypothesised smoothing role of deferred tax in arriving at the provision for the overall corporate tax charge. There is one observation of a negative ETR (during 1992). When this is controlled for using a dummy variable, the previously insignificant ETR coefficients do not take on significance (at generally accepted levels), however, in one of the two cases mentioned above, the ETR coefficient ceases to be significant at a generally acceptable level.

The relationship between the equity variable and the dependent variable is counter to expectations. The coefficient is negative in the aggregate models for both 1991 and 1992, significant at the 2.5% level in 1991 (5% in the case of IRLS estimation). Similarly, in the disaggregated models the coefficient is negative in the majority of cases and is statistically significant at the 1% level in one case for 1991 (two cases under IRLS estimation). This implies that firms over provide deferred tax in the year of an equity issue. This might result from firms being more cautious as a result of expectations of increased levels and / or intensity of market scrutiny surrounding and following a capital issue. Such behaviour, however, would be contrary to the finding of increased earnings management at the time of IPOs (Teoh et al., 1998). It is possible that earnings management precedes the issuance of equity and that a lagged explanatory variable is appropriate. As a further test, therefore, the 1991 models were re-estimated with a one year lagged equity variable. Although the resulting estimated coefficient is positive in the aggregated model and in three of the four disaggregated models, it is not statistically significant at generally accepted levels in any of them.

There is mixed evidence as to a relationship between audit firm quality and the level of earnings management. In the aggregated models the auditor variable had the anticipated negative sign only in 1991, but was not statistically significant. Likewise, insignificant were the positive signed

[54] When the binary profit independent variable is replaced by a continuous variable measuring profitability (pre-tax profit or loss as a percentage of sales) there is only very limited evidence of a significant relationship.

coefficients estimated in the 1992 models. The coefficient was, however, of the anticipated sign and statistically significant in two of the 1991 disaggregated models under the IRLS estimation. As an alternative test of the auditor quality hypothesis, the models were re-estimated using the absolute value of the appropriate dependent variable. This would be an appropriate formulation if auditors face a symmetrical loss function in respect of under- and over-provision. The results, not reported separately, do not indicate a statistically significant relationship in any of the models – though in all cases the relevant coefficient has a negative sign, lending weak support to the initial hypothesis.

Though there is a lack of generally acceptable levels of statistical significance in respect of the coefficient for the firm size variable in either 1991 or 1992, the coefficient is negative in all but two cases in the disaggregated models (or all but one when using IRLS estimation), and in all cases of the aggregated model. The lack of significance in respect of firm size, however, ought to be interpreted with caution. The data screening process removed a number of the larger, more complex firms with the result that the full range of firm sizes is not represented in the sample.[55]

The most consistent result is the positive relationship between the level of ACT and the dependent variable in all of the models: in every case it is significant at the 1% level. This lends support to the argument that firms recognise and take into account the dampening effect of surplus ACT when determining the level of earnings management required to achieve a desired net result. Of firms which under-provide, the greater the amount of ACT set off the higher the level of under-provision. This is consistent with the impact of deferred tax under-provision reducing the capacity to offset ACT and thereby resulting in an increase in the tax charge from the write-off of surplus ACT that can no longer be set off. In order to achieve a given net reduction in the tax charge, a greater level of under-provision is required in the presence of surplus ACT than is required in the absence of surplus ACT. Similarly, for those firms which over-provide, the level of over-provision increases with the level of ACT set off. By over-providing, the tax charge is increased, but it is simultaneously reduced by the avoidance (or reduction in the level of) ACT required to be written off. Therefore, a higher over-provision is required in the presence of surplus ACT in order to achieve a given reduction in after tax earnings. This result is consistent with the weaker evidence surrounding the influence of the level of effective tax rate, in that firms look at the overall effects on profits (in this instance, on tax charge), rather than on the effect on single line items. Regarding the relationship in respect of over-providing firms, an alternative motivation concerns the potential signalling implications of writing off surplus ACT: firms increase their capacity to offset ACT by over-providing deferred tax, thereby reducing the likelihood of having to write off ACT. This interpretation is suggestive that the writing off of surplus ACT through the current tax charge is a strong negative signal about the level of future profitability and dividends.

Under both OLS and IRLS estimation, the uncertainty control variable is positive and significant over both years in all cases but one. As reported in the univariate analyses, however, the variable's correlation with the absolute value of the dependent variable is not statistically significant. Its significance in a multivariate setting, therefore, may be in part due to the need for it to take a positive sign when the firm concerned is under-providing, and a negative sign when the firm is over-providing. To the extent that this variable fails to control fully for uncertainty and the other independent variables do proxy for uncertainty, then the estimated coefficients may be biased (Maddala, 2001). Although there is no reason to suspect that the other independent variables are, in fact, correlated with uncertainty, the models have been re-estimated, excluding from the sample all firms that be considered to be 'marginal' over- or under-providers (and whose under- or over-provision may, therefore, be inaccurately ascribed to earnings management). When firms whose under- or over-provision, as measured by the independent variable, is within the range ±5% are excluded on the basis that the scale of their under- or over-provision falls within a reasonable margin of error, then the distribution of under- and over-providers is as follows: in 1991 the number of under-providers – as calculated by expression (4) – falls to 12 and the number of over-providers is reduced to 30.

Similarly, in 1992, the number of under-providers is reduced to 14, and the number of over-providers to 30. When the models are re-estimated, the results are qualitatively the same as reported above, with the following exceptions where significance of the coefficient(s) is lost: under OLS estimation, the equity variable in the 1991 aggregated model, the profit and gearing variables in the 1991 disaggregated model based on a three-year horizon, and the profit variable in the 1992 disaggregated model based on a two-year horizon; and under robust estimation, the equity variable in both the 1991 aggregated model and the 1991 disaggregated model based on a two-year horizon, the auditor variable in the 1991 disaggregated model based on both a one and a two-year horizon, the direction of profit change variable in the 1991 disaggregated model

[55] A comparison of the maximum firm value in the initial and final (screened) samples shows this to be the case: in 1991 the values were £12,452m and £8,968m respectively; in 1992, £18,812m and £9,586m.

based on a two-year horizon, the adjustment to prior year tax variable in the 1991 disaggregated model based on a three-year horizon, and the profit variable in the disaggregated model for 1992 based on both a two-year and a three-year horizon.

As a further assessment of the sensitivity of the reported results to the proxy for forecasting uncertainty, two alternative measures were employed: the coefficient of variation of the level of net capital expenditure,[56] and the coefficient of variation of the level of sales[57] (both as measured over the maximum, four-year planning horizon). While these measures have limitations (for example, observed variations in capital expenditure may have been intentional, and the formal linkage between variations in planned capital expenditure and sales is unknown) the exercise is useful in assessing robustness. Results based on these two alternative control variables are not qualitatively different from those based on the analysts' forecast derived variable and, therefore, are not reported separately.[58] Overall, this additional analysis suggests that the reported results are not driven significantly by failure fully to capture uncertainty.

In summary, there is strong evidence of an association between levels of over- (under-) provision and profit status, level of adjustment to prior year tax and presence of surplus ACT. There is weaker evidence of an association with the levels of gearing and effective tax burden.

5. Summary and conclusions

This paper finds evidence of systematic differences between actual and required levels of deferred tax provision. The amounts involved are economically significant. In the most conservative of settings, that of firms without surplus ACT, the mean amount of under-provision represents 9.3% and 66.7% of pre-tax profits in 1991 and 1992 respectively. Comparable figures for those firms over-providing are 9.4% and 5.6%. Surprisingly, in the light of recent events, the majority of firms in the study over- rather than under-provided; and in each formulation of the focal dependent variable, its mean represented an over-provision.

Detected levels of under- and over-provision can result from a combination of earnings management and forecasting error. After controlling for uncertainty (proxied by cross-sectional variations in the predictability of firms' future earnings and, alternatively, by variations in capital expenditure and sales), there is support for some of the hypothesised earnings management incentives and influencers. In particular, there is evidence to support incentives and influencers concerning profit status, level of adjustment to prior year tax, and ACT. There is also evidence, albeit weaker, of incentives related to gearing and effective tax burden.

To the extent that earnings management is not transparent to the market, there is a potential welfare loss. The findings of this paper, however, taken in isolation, should not be used as an argument for increased limitation of managerial discretion in the determination of financial accounting estimates. In the specific setting of deferred taxation, indeed, there is evidence that the exercise of managerial discretion can result in value-relevant information, which would otherwise remain private and within the firm, being publicly disclosed (Citron, 2001).

This study has limitations: the difficulty in controlling for forecasting uncertainty with precision; relatively small sample size resulting from the inability of the model of required provisions to deal with timing differences other than those relating to capital allowances and other short-term differences (for example relating to interest and general provisions);[59] and, while a variety of results have been provided based on varying length of forecast horizon, the implicit assumption in estimating each model that all firms use the same period over which to estimate reversals. Given these limitations, care should be exercised in attempting to generalise the results.

The paper makes a number of contributions to the literature. In particular, the estimation of levels of potential earnings management uses, primarily, publicly available data and, therefore, avoids some of the limiting issues relating to existing methodologies. The paper develops a number of new hypotheses in relation to earnings management, in particular the influence of adjustment to prior year tax and current effective tax burdens, and the impact of and interaction with related accounting items, in this case ACT. The results relating to ACT support the view that firms engaging in earnings management focus on the overall net effect, rather than viewing each potential item in isolation. In focusing in a single profit and loss state-

[56] *Datastream* items 1024 and 1025.

[57] *Datastream* item 104.

[58] As compared with the reported results, the differences resulting consistently from both alternative control variables can be summarised as follows: 1991 – *GEAR* is not significant at 5% level in the aggregated model under robust estimation, *PROFIT* is not significant at 5% in the disaggregated model using a three-year forecasting period under robust estimation, *EQUITY* is not significant at the 5% in the aggregated model under either OLS or robust estimation, and *AUD* is not significant at 5% level in the disaggregated model using a two-year forecasting period under robust estimation; 1992 – *GEAR* is not significant at 5% level in the disaggregated model using a two-year forecasting period under robust estimation; but *ΔPBT* is significant in the same model. The general convergence in the results is to be expected given significant correlations amongst the three control variables.

[59] Albeit this may speak for the power of the methodology used in this study, since the sample constraint may well have resulted in the elimination of a number of larger, more complex firms, where, for example, capital market incentives to manage earnings may have been strong (thus making it harder to detect the hypothesised associations).

Appendix: example calculation of deferred tax under-provision from information disclosed in financial statements (accelerated capital allowances)

Consider a firm which uses straight-line depreciation at 20% p.a., enjoys capital allowances at 90% p.a. on a reducing balance basis, and faces a constant corporation tax rate of 33%. Assume that the firm starts with no fixed assets subject to depreciation or capital allowances, then acquires £1000 of such assets in year 1, £400 in year 2 and £20 in year 3. This would give rise to the following:

	Year 1	Year 2	Year 3
Per financial accounting			
Opening net book value	0	800	920
Additions	1,000	400	20
Depreciation	–200	–280	–284
Closing net book value	800	920	656
Closing cost	*1,000*	*1,400*	*1,420*
Per taxation computation			
Opening written down value	0	100	50
Purchases	1,000	400	20
Capital allowances	–900	–450	–63
Closing written down value	100	50	7
Cumulative timing difference	700	870	649

Assuming no other sources of timing differences and a forecasting period of two years for the purposes of computation of deferred tax, we should see the following disclosed in the financial statements of the firm:

Disclosed in FS at end of year 1	Total potential deferred tax as at end of year 1	231.00	= 700 x 33%	A
	Deferred tax provision	16.83	= (700–649) x 33%	B
Disclosed in FS at end of year 3	Total potential deferred tax as at end of year 3	214.17	= 649 x 33%	C

Therefore, any surplus of disclosed figure C over unprovided deferred tax at the end of year 1 (disclosed figure *A* less disclosed figure *B*) constitutes an over-provision of deferred tax at the end of year 1, and vice versa for under-provision. See Section 3.1 for general boundary conditions.

ment item, of course, this study potentially ignores the effect of earnings management which may have occurred via other account items. Through examining independently two different years, this study provides evidence that the strength of particular earnings management incentives can vary over time as well as across firms. Detecting earnings management using a new method, the paper corroborates existing earnings management studies and, in particular, adds to the limited number of existing UK earnings management studies.

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