INCREMENTAL VALUE RELEVANCE OF UNRECOGNIZED DEFERRED TAXES:

EVIDENCE FROM THE UNITED KINGDOM

Stephen Lynn
City University of Hong Kong
acsgl@cityu.edu.hk

Chandra Seethamraju
Mellon Capital Management, San Francisco
chandras@mcm.com

Ananth Seetharaman*
Saint Louis University
acas@slu.edu

City University of Hong Kong funded this project through a strategic research grant. Chan Yuk Sheung provided invaluable research assistance. Sudipta Basu and seminar participants at City University of Hong Kong offered useful comments.

*Corresponding Author. Address: Department of Accounting, John Cook School of Business, Saint Louis University, 3674 Lindell Avenue, St. Louis, MO, USA 63108

INCREMENTAL VALUE RELEVANCE OF UNRECOGNIZED DEFERRED TAXES: EVIDENCE FROM THE UNITED KINGDOM

ABSTRACT

We examine empirically whether the use of the partial method for deferred taxes provides incremental information of use to investors. Specifically, we test whether UK capital markets valued unrecognized deferred tax amounts reported in the footnotes to UK annual reports, pursuant to UK Statement of Standard Accounting Practice (SSAP) 15. Our empirical model is based on Feltham and Ohlson (1995). We run iterative weighted least squares (IWLS) regression of year-end share prices on a decomposition of book value per share for a pooled sample of UK firm-years drawn from the years 1993 through 1998, and find positive associations with price for net deferred tax assets—both recognized and unrecognized. Moreover, we are unable to reject the null hypothesis that both parts of deferred taxes have similar multiples in our price regressions. These findings support some theoretical predictions in Sansing (1998), Guenther and Sansing (2000, 2004), and Amir et al. (2001).

INTRODUCTION AND MOTIVATION

Deferred tax assets and liabilities arise because gains or losses from certain transactions are recognized in different time periods for financial accounting versus tax purposes. Accounting for deferred taxes has been a contentious issue in international accounting standard-setting (see, e.g., Accounting Standards Board [ASB] 1995). Under most current standards (e.g., both U.S. Financial Accounting Standard [FAS] 109 and International Accounting Standard [IAS] 12), deferred tax liabilities are recognized in full on all timing differences between the book value of assets and their tax bases. One deficiency of the full method, however, is that some timing differences may reverse very slowly, or indeed may never reverse—for example, if periodic reinvestment leads to new timing differences regularly offsetting reversals of older ones. To address this possibility, United Kingdom standard, SSAP 15, now superseded by Financial Reporting Standard (FRS) 19, required the partial method of accounting for deferred taxes. Under this partial method, firms only recognize that portion of a deferred tax that is projected to reverse in a horizon of a few years, with the unrecognized portion being reported in the footnotes to the financial statements.

Concerns have been raised that the partial method could be used for opportunistic earnings management (Gordon and Joos 2004; Arnold 1994). However, because it forces the disclosure of both the total deferred tax liability and also its decomposition into reversing and non-reversing components, one may surmise that the partial method is better for investors. Yet, a series of recent theoretical papers (Sansing 1998; Guenther and Sansing 2000, 2004)[1] argue just the opposite, i.e., that the timing

[1]Amir et al. (2001) obtain theoretical results that are very similar to those in Sansing (1998) and Guenther and Sansing (2000). However, they argue in favor of partial provision in that it may

of reversals is not value-relevant, so that the separation of deferred tax into reversing and non-reversing amounts does not provide information that is useful in valuing a firm.[2] Their theory also suggests that the full recognition amount is a better basis for valuation.

Unfortunately, the absence of U.S. data under the partial recognition method has hamstrung the ability of researchers to directly test whether or not the partial method is more relevant than the full method for investors. The "partial versus full recognition" issue is important for academic and standard setting purposes. To U.S. standard-setters, partial recognition has never been a serious option, at least for deferred tax liabilities. However, the issue is important for U.S. standard-setters in the wider context of international convergence of accounting standards. A key reason for the U.K. to change to full provision was convergence with IAS 12; IAS 12, in turn, requires full recognition to harmonize with U.S. practice. Evidence that full recognition is better would, therefore, strengthen the value of the U.S. standard as an international benchmark. Accordingly, a number of U.S. studies have examined the issue. In particular, Sansing (1998) and Guenther and Sansing (2000, 2004) build a theoretical

---

help firms to present a *discounted* liability even with a standard that prohibits discounting. All the theoretical work cited here agrees that the fair value of deferred tax net assets is at a discount to its book value (when the latter is undiscounted).

[2]An intuitive explanation as to why the timing of reversals does not matter within the framework of Sansing (1998), and Guenther and Sansing (2000, 2004), is as follows: Assume that the book depreciation rate represents the true economic depreciation rate for an asset (this assumption is not critical). Then, the amount that a new buyer would be willing to pay for the asset would be the same as its book value. However, if there is an accumulated deferred tax liability for the asset, the value of the asset to the current owner is less, because of the reduced tax benefit that the owner would get from the asset over its remaining life. The value to the owner is the present value of the remaining after-tax cash flows from the asset. The difference between what the new buyer will pay and the value to the current owner is the value of the deferred tax liability. This is not affected by how fast the deferred tax liability will reverse in the future, because however fast or slow it reverses, the remaining after-tax cash-flows to the current owner are exactly the same. Example 3 in Guenther and Sansing (2004) contains an illustration.

case for full recognition, while Amir et al. (2001) use similar theory to support partial recognition.[3]

We use a unique time period when the partial provision method was *the* authoritative standard in the UK and empirically test the theoretical predictions in Sansing (1998) and Guenther and Sansing (2000, 2004) that the unrecognized amount of deferred tax is valued at the same rate as the recognized portion, i.e., that the timing of reversals is irrelevant. We find evidence in support of these predictions, which evidence is also implied by theory in Amir et al. (2001). As noted earlier, the UK Accounting Standards Board, in the interests of conformity with international practice, adopted FRS 19 in December 2000, discontinuing the partial method in favor of the full method. IAS 12 has required full recognition of deferred tax liabilities effective from 1998. Our results suggest that the move to full recognition would not reduce the market's ability to value deferred tax liabilities.

PRIOR RESEARCH

Sansing (1998) uses a plausible analytical model to suggest that deferred tax is a real liability whose value at any time is invariant to when it will reverse. The logic is similar to arguments for dividend irrelevance—a postponed tax payment in any given period can be returned to the investor as dividends, or alternatively reinvested in the firm so that taxes are postponed again. In either case, the firm has the same value to the investor who can invest his dividends at the same after-tax rate as the firm. Sansing

[3] Gordon and Joos (2004) present evidence using UK data that partial recognition may lead to opportunistic earnings management, which issue is also of potential interest to accounting researchers and standard-setters in the U.S.

derives the following relation between the book value of a deferred tax liability (BVDTL) and its fair value (FVDTL). An important point is that BVDTL is measured using the liability method with full recognition.

$$FVDTL = \frac{\delta}{\delta + r}.BVDTL.$$

In this expression, δ refers to the tax depreciation rate, while *r* refers to the firm's cost of capital. Since this expression is invariant in the future time to reversal of the liability, the fair value is the same, whether the book value will reverse soon or whether it will never reverse. Also, the fair value is always at a discount to the book value. The theory here is focused on deferred tax liabilities arising from depreciation.

Guenther and Sansing (2000) extend Sansing (1998). Among other results, they examine valuation of a deferred tax asset arising from warranty expense. If estimated warranty liability is represented as an *undiscounted* amount, then they conclude that the associated deferred tax asset should be valued as follows, where BVDTA represents its book value and FVDTA its fair value.

$$FVDTA = \frac{\theta}{\theta + r}.BVDTA.$$

In this expression, θ represents the rate at which warranty costs will be realized, and *r* is the cost of capital as before. They also provide further results showing that the timing of reversals is not value-relevant.

Amir et al. (2001) use an analytical model based on Feltham and Ohlson (1995) to predict the valuation of deferred tax liabilities from depreciation. They agree with the papers mentioned earlier that the value of net deferred tax liability is not affected by reinvestment, and they also derive an identical expression for the discount factor to apply to BVDTL. However, they draw different conclusions from the earlier papers. Sansing (1998) and Guenther and Sansing (2000) are critical of the partial method, since it is based on time to reversal, and that should be value-irrelevant. But Amir et al. (2001) use similar results to *support* the partial method. They point out that correct valuation of the deferred tax liability requires it to be *discounted*—and when discounting is not allowed, the partial method may offer an alternative route to report a discounted amount.

Guenther and Sansing (2004) respond to a criticism in Amir *et al*. (2001) that their analysis takes a net liability perspective rather than an asset-by-asset perspective. SFAS 109, for example, requires an asset-by-asset determination of associated deferred tax liabilities. Currently, so does IAS 12. SSAP 15 took a net liability perspective. By comparing individual assets with different reversal rates, Guenther and Sansing (2004) show that their earlier result on the irrelevance of reversals holds on an asset-by-asset basis; they repeat their earlier criticism of the partial method. In Guenther and Sansing's model, the fair value of a deferred tax liability associated with a particular asset can be defined as the difference between the fair value of the depreciation tax shield available to an outsider who buys the associated asset at its book value, and the fair value of the depreciation tax shield available to the firm.

Gordon and Joos (2004) provide evidence that managers in the U.K. opportunistically measure deferred taxes to manage leverage. They do so by comparing the levels of recognized and unrecognized deferred tax to proposed firm-specific determinants of policy choice, under the assumption that debt contracting is a key driver of opportunistic earnings management in the U.K. They also show, however, that unrecognized deferred taxes do actually reverse on schedule (i.e., later than three years) to a large extent.

Citron (2001) uses U.K. data from 1989 to 1991 to run a regression of market value on balance-sheet components including deferred tax components. He finds a zero coefficient on his measure of recognized deferred tax liability and a positive coefficient on his measure of unrecognized deferred tax liabilities. However (unlike us), Citron deflates all variables by total assets. In such a specification, both his dependent variable and his measure of unrecognized deferred tax are closely associated with firm growth opportunities, and this likely drives his results. When Citron adds a proxy for growth in the form of a measure of capital expenditure to his model, his earlier results disappear.

Arnold (1994) also provides some related, tangential evidence. He runs logistic regressions on a sample of UK firms, drawn from the 1977-78 period, when UK SSAP 11 had been withdrawn and UK SSAP 15 had not yet been introduced, to identify firm-specific determinants of deferred tax policy choice (UK SSAP 11 was an early attempt to introduce full recognition, withdrawn without ever being implemented due to protests from firms. Its successor was SSAP 15). He concludes that a number of firm-specific variables, which reflect managerial interests, are significantly associated with this policy choice.

A number of previous studies have attempted to assess empirically the value-relevance of deferred tax numbers using U.S. data. Beaver and Dukes (1972) compare the returns-earnings association for unexpected earnings numbers calculated with and without deferred tax. They find that returns are more highly correlated with earnings numbers that incorporate deferred tax amounts than for those that do not, and conclude that deferred tax provides value-relevant information to the market.

Chaney and Jeter (1992) obtain similar results. They find a negative association between deferred tax expense and stock returns using 1982-83 data, and further observe that non-recurring elements of deferred tax expense were valued less negatively than recurring elements.

Givoly and Hayn (1992) study the association of returns calculated using windows around news releases around the introduction of the 1986 Tax Reform Act with contemporaneous changes in net deferred tax liabilities to assess the value-relevance of deferred tax. They document a positive association, and conclude that the market both prices deferred tax numbers and is sensitive to the likelihood of their reversal. Similarly, Ohlson and Penman (1992) observe that deferred tax has significantly less association with contemporaneous returns than other components of book value or earnings

Amir et al (1997) and Ayers (1998), in separate empirical appraisals of FASB SFAS 109, relate balance-sheet numbers to firm market values to determine value-relevance. Amir et al (1997) are concerned with the incremental value-relevance (over SFAS 96) of the SFAS 109 requirement that components of deferred tax assets and liabilities be disclosed separately based on their source. Ayers (1998) seeks to compare SFAS 109 with the earlier APB 11, which required the deferral method. He is therefore primarily concerned with whether the liability method adds value-relevance over the deferral method.

Because our study uses an empirical model derived from Amir et al. (1997), a brief discussion of both Amir et al. (1997) and the similarly-designed Ayers (1998) paper would be instructive. Amir et al (1997) attempt to empirically estimate a variant of the model in Feltham and Ohlson (1995), which relates the market value of equity to a linear combination of net operating assets, net financial assets and unexpected operating income. They add net deferred taxes to this list of determinants and further disaggregate it into seven groups based on SFAS 109 classifications. Using a sample of Fortune 500 companies and drawing their data from the COMPUSTAT and Compact Disclosure databases, they estimate their model cross-sectionally for the years 1992, 1993 and 1994, and also using a pooled sample covering the same period. The overall results indicate that net deferred taxes calculated using the full recognition approach are value-relevant.

Ayers (1998) performed cross-sectional regressions on a sample of NYSE/AMEX firms that adopted SFAS 109 in 1992 or 1993 to estimate a variant of models in Landsman (1986) and Barth (1991) that relate share prices to balance-sheet numbers. His analysis regresses share price on a number of balance-sheet components, including net deferred tax liability. Net deferred tax liability is further decomposed into two numbers: the APB 11 number and the cumulative effect of SFAS 109 adoption (both separately disclosed under SFAS 109). He further proceeds to test separately whether two particular innovations in SFAS 109 over APB 11 are value-relevant: (a) the relatively liberal rules on deferred tax asset recognition in SFAS 109, and (b) the effect (in terms of tax rate adjustments) of moving from the deferral to the liability method. Both innovations were found to be value-relevant.

Several papers have investigated the predictive properties of deferred taxes and/or the differences between book and taxable income using U.S. data. These include Lev and Nissim (2004), Hanlon (2005), and Hanlon et al. (2005) among others. Miller and Skinner (1998) investigated the determinants of the valuation allowance under SFAS 109, while Kumar and Visvanathan (2003) examined the information content of the valuation allowance. Holthausen and Watts (2001) state that the existence of corporate income taxes can also lead to conservatism in accounting. They cite Guenther et al. (1997), who discusses the effect of court decisions and IRS behavior on the relation between accruals for tax purposes and accruals for financial reporting purposes. A number of studies also look at the issue of disclosure versus regulation in other contexts such as oil and gas accounting or post-retirement benefit accounting. Examples include Aboody (1996), Davis-Friday et al. (1999, 2004) and Barth et al. (2003).

Our study uses an empirical model whose design is loosely based on Amir et al. (1997) but differs obviously from that paper in its objective and population of interest. We differ from Citron (2001) in our theory, results and our empirical model, which is more closely based on Feltham and Ohlson (1995). Our contribution differs from that of Gordon and Joos (2004) in that while their concern is more with reliability, ours is on relevance with direct reference to market valuation of deferred tax. Gordon and Joos (2004) do have results on relevance—they specifically show, for example, that the unrecognized portion of deferred tax is useful in predicting future reversals, but their results do not tell us whether the information is relevant in valuation. Recent theory discussed earlier suggests that the information is not relevant to valuation. Our research design and experimental setting permits us to test whether the UK market agrees.

Hypotheses

Our theoretical hypotheses can be framed as follows (in null form):

H10: (in null form): The market does not place a positive value on the unrecognized portion of net deferred tax assets.

H20: (in null form): The market values both the recognized and unrecognized portions of net deferred tax assets at the same rate.

If Sansing (1998) and Guenther and Sansing (2000; 2004) are correct, we would accept the null hypothesis for H2, while we would reject it for H1.

RESEARCH DESIGN AND DATA

Research Design

Feltham and Ohlson (1995) show that under "clean surplus accounting" and the further assumption that only net operating assets generate income, unrecorded goodwill is equal to the present value of expected future abnormal operating earnings. This can be defined as actual operating earnings minus the cost of capital times the beginning-of-period net operating assets. Amir et al. (1997) argue that net deferred taxes are important in determining unrecorded goodwill, since even if they do not generate abnormal earnings in the current period, their presence and classification on the balance-sheet may affect investors' perceptions of future abnormal earnings. Consistent with this argument, they obtain the following valuation equation:

$$P_t = \gamma_0 + \gamma_1 NOA_t + \gamma_2 NFA_t + \gamma_3 AE_t + \gamma_4 DT_t + \tilde{\varepsilon}_t \qquad (1)$$

Equation (1) represents the market value of equity (P_t) at time t as a function of net operating assets (NOA_t), net financial assets (NFA_t), current abnormal operating earnings (AE_t) and net deferred taxes (DT_t) at time t. Here "net deferred taxes" refers to the full-recognition balance-sheet amount. Since we are interested in the differential valuation of the partial method liability and the unrecognized amount disclosed in footnotes, we disaggregate DT_t into two components. The first component consists of the amount of deferred tax actually recognized on the balance sheet under the partial method. The second component is the incremental amount of deferred tax that would be recognized under full recognition. This amount is reported as a footnote disclosure in the U.K. If the partial method contributes to value-relevance, we would expect the valuation coefficients on each of these components to differ. Further, if the rationale behind the partial method approach is sound, we would expect the valuation coefficient on the second component mentioned above to be zero. Such an argument leads to the following empirical equation:

$$P_t = \beta_0 + \beta_1 NOA_t + \beta_2 NFA_t + \beta_3 EARN_t + \beta_4 REC_t + \beta_5 UNREC_t + \varepsilon_t \quad (2)$$

where P is the stock price of the firm, NOA is Net operating assets, NFA represents Net Financial Assets, REC is the amount of recognized deferred taxes and UNREC is the amount of unrecognized deferred taxes. We use current-period unlevered earnings per share EARN as a proxy for abnormal earnings per share. A similar approach to the empirical estimation of the Ohlson (1995) model has been taken by Barth et al. (1998)

amongst other papers where current period earnings has been used as a proxy for abnormal earnings. In addition, in Equation 2, we include dummy variables for industry and years to control for time and industry fixed effects. For reasons described in the results section below, we reject OLS and use an iterative weighted least squares (IWLS) estimation procedure (see Appendix).

If we define our variables following the convention that assets and income are recorded as positive numbers and liabilities and losses as negative numbers, we expect that all coefficients in this model would be positive. If valuation depends on the time to reversal, we would expect a larger coefficient on REC_t than on $UNREC_t$, The opposite is true if predictions of Sansing and Guenther and Sansing hold. Our hypotheses can now be stated in terms of the expected signs of the coefficient estimates:

H10: The null hypothesis is that $\beta_5 = 0$, against the alternative $\beta_5 > 0$.

H20: The null hypothesis is that $\beta_4 = \beta_5$, against the alternative $\beta_5 < \beta_4$.

Data and Variables

We collect data for the period 1993 through 1998. The reason for the 1998 cut-off is that IAS 12 prohibited the partial method effective from that year, which could affect our sample firms. Our final sample consists of 1628 firm year observations. These are firm-years for which the required prices and financial statement data could be obtained from the Compustat Global database, excluding the deferred tax details which were obtained directly from full-text annual reports available on the Thomson Researcher Global Access/Worldscope full-text database, supplemented by reference to company web-sites where necessary. We restricted the sample to firms from six Sharpe industry groups (Sharpe 1982) following Amir et al. (1997). Some firms that do not report using the GBP (Pound sterling) as their functional currency were also excluded.

Variables are defined closely following their definitions in Amir et al. (1997). PRICE, P_t, is calculated using the closing share price for an ordinary share at the year *t* balance-sheet date. NFA_t, Net financial assets is calculated by netting off the sum of cash and cash equivalents and investments against the sum of long term debt (including its current portion) and preferred stock. NOA_t, Net operating assets is calculated as the book value of shareholders' fund minus the sum of recognized deferred tax (REC_t) and our proxy for net financial assets (NFA). REC_t and $UNREC_t$ are the recognized deferred tax liability and the unrecognized portion reported in footnotes respectively. EARN is actual operating income and is calculated as reported basic earnings-per-share (excluding extraordinary items) net of tax-adjusted interest income and expense per share. The tax rate used in the interest adjustment is the effective tax rate calculated from Compustat, winsorized at 0 and 50%. Industry dummies are based on Sharpe industry groups (Sharpe 1982) following definitions in Amir et al. (1997, Table 1). The precise definition of each Sharpe industry group in terms of Compustat four-digit SIC codes is given in the note to our Table 1.

We deflate all financial statement variables except EARN using the number of common shares outstanding at balance-sheet date, i.e. they are expressed as per-share numbers. All numbers are measured in terms of the original reporting currency, and as noted earlier, attention is restricted to firms that report using the British Pound (GBP) as their functional currency.

RESULTS

We provide summary statistics for variables of interest in our sample in Table 1. The price distribution shows that more than 75% of firms have prices that are lower than GBP 4 per share. By contrast, Amir et al. (1997) report a median price of USD 29, and 1^{st} and 3^{rd} quartiles of USD 19.75 and USD 40.81 respectively. While their sample is perhaps more biased towards large firms (the Fortune 500 is their starting point), the difference in the price distribution also reflects an institutional difference between the U.S. and U.K. markets.

The price range is wide, the minimum price is 0.03 and the maximum is 242.31. This leads to an outlier problem when we run OLS regressions—we comment on and address this issue later. Our independent variables are also proportionately smaller than those in Amir et al. (1997). Like them, we observe that most sample firms are net debtors, leading to a negative mean and median for NFA. We observe an average NOA that is 70% of the average PRICE, but with a wider dispersion than PRICE. A similar pattern is observed in Amir et al. (1997), though their mean NOA is 80% of mean price. Also, again like Amir et al. (1997), net deferred tax asset amounts are negative on average—both REC and UNREC. Not surprisingly, the average observation in our sample has a net deferred tax liability. Gordon and Joos (2004) also find that on average the net unrecognized amount is a liability.

We find that the mean amount of unrecognized deferred taxes (UNREC), -0.065, is more than double that of the mean recognized amount, REC, -0.029 per share. Similar to Gordon and Joos (2004), we observe deferred tax amounts that are higher relative to price than those observed by Amir et al. (1997) with U.S. data (on average around 4% of market value in magnitude compared to 1% in their U.S. sample). This is partly because Amir et al. (1997) report deferred tax numbers that are net of the FAS 109 valuation allowance, while the 4% figure includes UNREC. But the difference also reflects higher corporate tax rates and steeper tax depreciation in the U.K.

Table 2 reports pair-wise correlations between our regression variables, none of which indicate a potential multicollinearity problem. This is confirmed by low variance inflation factors in our OLS run. OLS results reported in column 1 of Table 3 are inconsistent with theory. We expect positive coefficients on every financial statement variable, with the possible exception of unrecognized deferred tax. We suspect that the implausible results are due to a scaling problem, a known issue in price levels regressions (see, e.g., Easton and Sommers 2003; Barth and Kallapur 1996; Easton 1998; Brown, et al. 1999; Lo and Lys 2000; Livnat 2000, and Barth and Clinch 2001). Briefly, the scaling problem arises because the dependent variable (price) is prone to large outliers, to which OLS estimation is sensitive. We perform various standard procedures to correct for the presence of outliers in the dependent variable. These are reported in Table 3 and described below.

First, we winsorize the price variable at two standard deviations—the results are reported in column 2 of Table 3.[4] The adjusted R-squared declines sharply, and the

[4]We also winsorize at three and one standard deviations, with similar results, not reported in the table.

estimated coefficients remain anomalous. Second, we delete outliers by removing observations with a Cook's distance of greater than 4/N in the full-sample OLS run (where N=1628). The results are reported in column 3 of Table 3. The number of observations removed under this criterion is 30, or around 2% of the original sample. After deleting these outliers, our adjusted R-squared improves to 38%. The coefficients on the financial statement variables are now positive as expected, with the important exception of recognized deferred tax, which is insignificantly negative. Third, we delete outliers by removing observations with absolute studentized residuals greater than 1.96 (the approximate 5% two-tailed cut-off value). The results are reported in column 4 of Table 3. Twenty observations are removed, or around 1.2% of the original sample. The adjusted R-squared is 25%, markedly better than the baseline OLS in column 1. Also, after deleting the outliers, we obtain positive parameter estimates for all financial statement variables, consistent with Feltham and Ohlson (1995) predictions, and also similar to results in Amir et al (1997), who adopted a similar procedure to deal with outliers. There are, however, remaining anomalies. The estimated coefficient on UNREC is much higher than theory would predict, and the estimated EARN parameter, while theoretically acceptable, indicates surprisingly low persistence.

A more sophisticated approach to dealing with outliers is Iterative Weighted Least Squares (IWLS). The procedures for columns 3 and 4 of Table 3 may be subject to error in identifying outliers. This is because outliers would distort OLS parameter estimates, and then these distorted estimates are in turn used to identify outliers. Put differently, it is possible that true outliers may escape detection, while the deleted observations may not be real outliers.

Iterated Weighted Least Squares seeks to overcome this problem, by repeating the OLS regression in several stages, and identifying outliers anew at each stage. The iteration is stopped when the parameters converge to levels that are robust to further tests for outliers. At each stage, rather than deleting observations that are identified as outliers, weighted least squares is used, where outliers are down-weighted and so have less influence on the parameters.

We run our estimation using an IWLS procedure. Details are in the Appendix, and are summarized in this paragraph. Specifically, we seek Huber generalized maximum likelihood estimators (M-estimators) of our regression parameters, through an iterative weighted least squares procedure that sequentially improves parameter estimates and scale estimates in successive iterations, and uses a bi-square weight function. A previous example of an accounting paper that uses robust regression is Basu and Markov (2004).

The IWLS results are presented in Table 4, alongside the OLS results from column 4 of the previous table. IWLS parameter estimates are close to theoretical predictions. For example, as the Ohlson model would predict, all estimated coefficients are positive, the coefficient on NOA is approximately one, that on NFA is close to the theoretical prediction of one, the coefficient on EARN is within the theoretically expected range of 0 to $1/r$ where r is the cost of capital.[5] In particular, the coefficients on both REC and UNREC are significantly positive, lie between 0 and 1, and are close to each other, consistent with predictions in Sansing (1998), and Guenther and Sansing (2000,

[5]The coefficient estimate however is still towards the low end of this range, suggesting low earnings persistence on average, which we discuss and correct later.

2004). Also, coefficient estimates on deferred tax components are weaker than those on other components, similar to Amir et al. (1997).

The IWLS diagnostics classify 6% of observations as outliers, i.e., observations with robust residuals of magnitude greater than 3. The IWLS results do not indicate a statistically significant difference between the coefficients on REC and UNREC—the 95% coefficient intervals for these coefficients overlap, so that we cannot reject the null of no difference between them. This "result" supports Guenther and Sansing (2004), who predict that time to reversal—the basis of the REC and UNREC distinction—is not value-relevant. This is especially true given Gordon and Joos's (2004) empirical result that unrecognized deferred taxes do in fact reverse more slowly than recognized amounts.

It may be argued that accepting (failing to reject) a null hypothesis proves little, since it still can be rejected by a more powerful test. We therefore examine confidence intervals around the estimated difference between the coefficients on REC and UNREC to help draw inferences.[6] The estimated asymptotic 95% confidence interval for this difference ranges between -0.39 and 0.46. In other words, if we had set up equality of coefficients as our *alternative* hypothesis against a null hypothesis that the difference between the coefficients was some non-zero value, say *x*, then we would reject that null hypothesis for all values of *x* less than -0.39, and all values of *x* greater than 0.46. We cannot conclude that the coefficient on REC is equal to that on UNREC, but we can infer with 95% confidence that the coefficient on REC is not more than 0.39 less, or more than 0.46 greater, than that on UNREC. Our results thus provide limited support to

[6]We use the estimated asymptotic covariance matrix described in the appendix to estimate the confidence intervals.

coefficient equality by supporting an inference that these numbers bound the true difference.

We may also artificially increase the power of a test by simply increasing its required significance level. At the extreme, a test with a 100% required significance level would always reject the null hypothesis. By how much can we increase the required significance level for our test without rejecting the null hypothesis of equality of deferred tax coefficients? It turns out that we can increase the significance level up to 87% without rejecting the null hypothesis of coefficient equality. In other words, we would need a much more powerful test to do so.

The IWLS estimated coefficient on EARN is still low. This could be due to low persistence across the cross-section of firms. An estimate of the average EARN persistence can be obtained by regressing EARN on lagged EARN in the pooled sample and looking at the coefficient on lagged EARN. Such a coefficient is low, around 0.16. This low average persistence of EARN is likely driven by the tails of the EPS distribution—when we winsorize the EARN variable at the top and bottom vigintiles and re-run the IWLS regression, we observe an increase in the estimated coefficient on EARN, while other coefficient estimates shrink. It appears that the weak coefficient on EARN is driven by an analogue of the result in Freeman and Tse (1992)—for larger magnitudes of EARN, earnings persistence and therefore the PRICE-EARN association is lower.

In order to control for cross-sectional variations in earnings persistence, we use a technique similar to that used in Bartov et al. (2007). Specifically, we add an interaction term between EARN and EARNMAG, where EARNMAG represents the quintile of the absolute value of EARN. The results are shown in Table 5. The estimated coefficient on EARN improves to 3.9, while the coefficient on the interaction term is significantly negative—the valuation of EARN is highest for lower more persistent magnitudes of EARN, and reduces for higher less persistent magnitudes. Other coefficient estimates are similar to those in Table 4.

The analysis of confidence intervals that we introduced and discussed earlier is as follows for the Table 5 analysis: The estimated asymptotic 95% confidence interval for the difference between REC and UNREC ranges from -0.31 to 0.52. Also, we can increase the required significance level to 62% without rejecting the null hypothesis.

As another sensitivity test, we estimate a regression of returns on components of changes in book value and changes in earnings. This specification is less prone to statistical problems than the price regression. To keep our analysis as consistent as possible with our earlier regression, we deflate by the number of shares.[7] We run pooled OLS and IWLS estimations of the parameters in the following equation using the same sample as before:

$$\begin{aligned}
&RETURN_{it} = b_0 + b_1 DNOA_{it} + b_2 DNFA_{it} + b_3 DEARN_{it} + \\
&b_4 DEARN_{it} * DEARNMAG_{it} + b_5 DREC_{it} + \\
&b_6 DUNREC_{it} + b_7 DPS_{it} + \tilde{\varepsilon}_{it}.
\end{aligned}$$

Variables are defined as follows. The subscripts *i* and *t index firms and years respectively.* RETURN in year *t* is the change in market capitalization from the previous year, deflated by the closing number of shares, DNOA in year t is the change in total net operating assets from the previous year, deflated by the closing number of shares.

[7] We also run the analysis after deflating by lagged price instead and obtain similar inferences.

DNFA in year *t* is the change in total net financial assets from the previous year, deflated by the closing number of shares. DEARN in year *t* is the change in total operating income (as defined earlier) deflated by the closing number of shares. DEARNMAG refers to the quintile of the absolute value of the DEARN variable. We include this in an interaction term with DEARN to control for cross-sectional variations in the persistence of earnings. DREC and DUNREC in year t are the changes in total recognized and unrecognized net deferred tax assets respectively, deflated by the closing number of shares. DPS refers to the dividends per share in year *t*. Dummies for year and Sharpe industry codes are included in the regression.

For the OLS regression, we start with 1109 firm-years and to control for outliers, drop observations with Cook's distance greater than 4/N or student residuals greater than 1.96, based on residuals calculated in an initial OLS run. This leaves us with a sample of 1054 firm-years. As an additional control for outliers, we also winsorize the RETURN variable at three standard deviations.

Our results are reported in Table 6. The OLS estimated coefficients on both DNOA and DNFA are lower than the corresponding terms in the levels regression, while the estimated coefficient on DEARN is higher than before, and decreases with higher levels of DEARN. The OLS estimated coefficients on both deferred tax components are insignificant. Under IWLS, all the changes in balance-sheet items have significant positive coefficients including the coefficients on both DREC and DUNREC. But the estimated coefficient on DUNREC is significantly lower than that on DREC.

We interpret the difference in our Table 5 and Table 6 results as follows. Predictions for the valuation of net deferred tax assets may not directly apply to *changes* in these assets. The change in balance-sheet deferred tax is a mixture of components with differing persistence, including for example, the effect of new timing differences during the year, the effect of changes in tax rates on the previous deferred tax balances, and the effect of revisions in forecasted reversals on the previous deferred tax balances. If, as seems likely, the change in unrecognized deferred tax has a higher share of the less persistent components, then it will have a lower market valuation, quite independent of the effect predicted by Sansing (1998) and Guenther and Sansing (2000, 2004). The significant difference between the DREC and DUNREC coefficient estimates in Table 6 is not therefore a direct rejection of their theory, and is also not necessarily inconsistent with the result observed in Table 5.

Overall, our results support rejection of the null hypothesis 1, i.e., H10 and acceptance of the null hypothesis 2, i.e., H20. That is, we can conclude, as predicted by Sansing (1998), Guenther and Sansing (2000, 2004) and Amir et al. (2001), that the unrecognized portion of net deferred tax assets has value to investors. Further, we cannot conclude that the discount factor on the unrecognized portion is different from that on the recognized portion, again supporting Sansing (1998), Guenther and Sansing (2000, 2004) and also Amir et al. (2001), who agree that this should be true for the firm-wide net deferred tax liabilities from depreciation. If the cost of capital is 10% and the average tax depreciation is 40%, then the fair value of net deferred tax assets from depreciation should be 80% of their book value, which is close to the estimate we have. This can be contrasted with the figure of 0.56 that Givoly and Hayn (1992) observed for U.S. firms. The difference could reflect more generous capital allowances in the U.K. during the study period.

CONCLUSIONS

In this study we examine whether use of the partial approach provides incremental information of use to investors. Put differently, from a theory-building perspective, we seek to test the prediction from Sansing (1998) that the unrecognized amount of deferred tax is value-relevant. We find evidence in support of Sansing (1998) and Guenther and Sansing's (2000) predictions that unrecognized DT has value and show that in the UK the unrecognized amount of deferred taxes are value relevant for the period 1993 to 1998. While our results support the inference that information about the timing of reversals is not relevant for valuing the deferred tax liability, it does not necessarily follow that the SSAP 15 deferred tax footnote information is value-irrelevant. The footnote could provide information on the firm's future investing plans, and thus help in estimating its unrecorded goodwill. Often, however, this information can be gleaned from other sources so that the marginal information content of the footnote information on unrecognized amounts is likely to be small.

From arguments in Amir et al. (2001), partial recognition can be used by managers to signal an appropriate discount rate for valuing deferred tax items, by setting the recognized portion of deferred tax to be approximately equal to the discounted value of the total amount. But our results suggest that this is not what managers do. From Table 4, we may surmise a plausible discount factor of around 0.8. But on average in our sample, recognized deferred tax is less than 80% of the total, in fact it is less than half. Our results are not consistent with managers using their discretion under SSAP 15 to provide signals of the discount rate applicable to deferred tax.

Earlier results suggest that SSAP 15 partial recognition numbers have questionable reliability as they may be subject to opportunistic earnings management. Our results further suggest that their marginal relevance is low—the market values both recognized and unrecognized amounts, and we cannot infer that it values them differently. Taken together, these results suggest that the SSAP 15 partial method has low reliability and low marginal relevance, and support the change to the full method in FRS 19.

Interestingly, Feltham and Ohlson (1995) predict a coefficient on NOA and NFA of exactly 1, and a coefficient on EARN of between 0 and 1/r (where r is the cost of capital) depending on persistence. Extending to deferred taxes, Sansing (1998) and its extensions in Guenther and Sansing (2000, 2004) predict that the coefficient on both recognized and unrecognized deferred taxes should be strictly greater than 0 and strictly less than 1. In our case, these predictions are accurately confirmed when we adopt a robust regression procedure that systematically down-weights the effects of extreme observations. This suggests that Feltham and Ohlson (1995) describe the UK market's valuation well and that the IWLS procedure described and applied here may be useful in resolving the scale problem that arises.

The theory that we test relates mainly to the recognition of deferred tax liabilities based on the timing of reversal. Some deferred tax items, such as operating loss carry-forwards, are recognized instead on the basis of the estimated probability of realization. However, the presence of these items would bias against our accepting H2, since they would clearly have a lower valuation for the un-recognized amounts. Also, we implicitly assume that the mix of sources of deferred tax are the same for both recognized and unrecognized deferred tax, since differences in average tax depreciation rates for different components would lead to different valuations of the recognized and unrecognized amounts. Again, the presence of these differences would bias against our accepting H2. Unfortunately, typical SSAP 15 disclosures do not allow us to unambiguously identify the exact source of different deferred tax items. However, under the reasonable assumption that depreciation-related differences are a major driver of both recognized and unrecognized net deferred tax assets over the cross-section of firms, it is reasonable to use the aggregate deferred tax to test the theory.

REFERENCES

Aboody, D., 1996. Recognition versus disclosure in the oil and gas industry. *Journal of Accounting Research* (34): 21-32.

Accounting Standards Board (ASB). 1985. Statement of standard accounting practice No. 15 accounting for deferred taxation, London: Accounting Standards Board.

Accounting Standards Board (ASB). 1995. Accounting for Tax, London: ASB discussion paper.

Accounting Standards Board (ASB). 2000. Financial Reporting Standard 19. Deferred Tax. London: Accounting Standards Board.

Amir, E., Kirschenheiter, M. and Willard, K., 1997. The valuation of deferred taxes, *Contemporary Accounting Research* 14:4 (winter), 597-622.

____________________. 2001. The Aggregation and Valuation of Deferred Taxes, *Review of Accounting Studies*, 2001, 6 (Jun-Sep), 275-297.

Arnold, A.J., 1994. The adoption of partial deferral in the UK, 1977-1978: Evidence on an Accounting Choice. *Journal of Business Finance and Accounting*, 21:6 (Sep): 875-888.

Ayers, B.C. 1998. Deferred tax accounting under SFAS No. 109: An empirical investigation of its incremental value-relevance relative to APB No. 11. *The Accounting Review.* 73:2 (April): 195-212.

Barth, M.E. 1991. Relative measurement errors among alternative pension asset and liability measures, *The Accounting Review* (July): 433-463.

__________, Clement, M.B., Foster, G. and Kasznik, R. 1998. Brand values and capital market valuation. *Review of Accounting Studies* (Vol 3) 1998.

_________ and Clinch, G. 2005. Scale effects in capital markets-based research, Stanford: Unpublished working paper.

_______, _______, and Shibano, T. 2003. Market effects of recognition and disclosure. *Journal of Accounting Research* 41 (4), 581–609.

__________ and Kallapur, S. 1996. The effects of cross-sectional scale differences on regression results in empirical accounting research. *Contemporary Accounting Research*, 13, 2, 527-568.

Bartov, E., Lynn, S. and Ronen,J. 2007. Returns-Earnings regressions: An integrated approach. New York University: Unpublished working paper.

Basu, S. and S. Markov. 2004. Loss function approximations in rational expectations tests on financial analysts' earnings forecasts. *Journal of Accounting and Economics*, 38, 171-203.x

Beaver, W.H. and Dukes, R.E. 1972. Interperiod tax allocation, earnings expectations and the behavior of security prices. *The Accounting Review* 47 (April), 320-32.

Brown, S., Lo, K. and Lys, T., Use of R-squared in Accounting Research: Measuring changes in value relevance over the last four decades, *Journal of Accounting and Economics*, 28, 83-115.

Chaney, P. and Jeter, D., 1994. The effect of deferred taxes on security prices, *Journal of Accounting Auditing and Finance.* 91-116.

Citron, 2001, The Valuation of Deferred Taxation: Evidence from the UK Partial Provision approach, *Journal of Business, Finance and Accounting*, 28(7) & (8), 821-852.

Davis-Friday, P.Y., Folami, L.B., Liu, C., Mittelstaedt, H.F. 1999. The value relevance of financial statement recognition and disclosure: Evidence from SFAS No. 106, The Accounting Review, 74(4), 403-423.

______________, Liu, C., Mittelstaedt, H.F. 2004. Recognition and disclosure reliability: evidence from SFAS No. 106, *Contemporary Accounting Research*, 21(2), 399-430.

Easton, P. 1998. Discussion of "Revalued Financial, Tangible and Intangible Assets: Association with Sharpe Prices and Non-market-based estimates." *Journal of Accounting Research* 36 (Supplement): 235-247.

_________, and Sommers, G.A. 2003. Scale and the scale effect in market-based accounting research. *Journal of Business Finance and Accounting* 30 (January/March): 25-55.

Financial Accounting Standards Board (FASB), 1980, Statement of Financial Accounting Concepts No. 2, Qualitative Characteristics of Accounting Information, Norwalk, CT: FASB.

Financial Accounting Standards Board (FASB), 1992, Statement of Financial Accounting Standards No. 109, Accounting for Income Taxes, Norwalk, CT: FASB.

Feltham, G.A. and J.A. Ohlson. 1995. Valuation and clean surplus accounting for operating and financial activities, *Contemporary Accounting Research* 11 (Spring): 689-732.

Freeman, Robert N. and Senyo Y. Tse. 1992. A nonlinear model of security price responses to unexpected earnings. *Journal of Accounting Research*, Vol.30, pp. 185 - 209.

Givoly, D. and C. Hayn. 1992. The valuation of the deferred tax liability: evidence from the stock market. *The Accounting Review*, 67 (April): 394-410.

Gordon, E.A. and P.Joos. 2004. Unrecognized deferred taxes: Evidence from the U.K. *The Accounting Review*, 79 (January): 97-124.

Guenther D.A. and R.C. Sansing. 2000, Valuation of the firm in the presence of temporary book-tax differences: The role of deferred tax assets and liabilities, *The Accounting Review*, 75 (January), 1-12.

____________________________. 2004. The valuation relevance of reversing deferred tax liabilities. *The Accounting Review*. 79 (April): 437-451

____________, Maydew, E.L., Nutter, S.E., 1997. Financial reporting, tax costs, and book-tax conformity. *Journal of Accounting & Economics* 23, 225-248.

Hampel, F.R., Ronchetti, E.M., Rooseeuw, P.J. and Stahel, W.A., 1986, Robust statistics: the approach based on Influence functions, New York: John Wiley and Sons, Inc.

Hanlon, M., 2005,_The persistence and pricing of earnings, accruals, and cash flows when firms have large book-tax differences. *The Accounting Review*, vol. 80, p. 137-166.

__________., LaPlante, S.K. and Shevlin,T., 2005, Evidence on the Information Loss of Conforming Book Income and Taxable Income, *The Journal of Law and Economics*, (48): 407-442.

Kumar, K.R. and Visvanathan, G. 2003. The information content of the deferred tax valuation allowance. *The Accounting Review* (78): 471-90.

Landsman, W., 1986, An empirical investigation of pension fund property rights. *The Accounting Review*, 61 (October), 662-691.

Lev, B and Nissim, D. 2004, Taxable Income, Future earnings, and equity values, *The Accounting Review.* (79): 1039-1074.

Lo, K. and Lys, T. 2000. The Ohlson Model: Contribution to Valuation Theory, Limitations and Empirical Applications, Journal of Accounting Auditing and Finance, 15,3, 337-367.

Ohlson, J.A. and S.H. Penman. 1992, Disaggregated accounting data as explanatory variables for returns, *Journal of Accounting Auditing and Ffinance*, 7 (Fall): 553-73.

Sansing, R., 1998, Valuing the deferred tax liability, *Journal of Accounting Research*, 36(2), 357-363.

SAS Institute. 2004. The ROBUSTREG PROCEDURE, Chapter 62 in The SAS/STAT® 9.1 User's Guide, Cary, NC, USA: SAS Institute Inc., pp.3971-4030.

Sharpe, W.F.1982. Factors in New York stock exchange security returns, 1931-79. *Journal of Portfolio Management* (8): 5-19.

APPENDIX

Iterative Weighted Least Squares

The main statistical problem encountered in our data set is a large number of outliers in the response direction (dependent variable). Approximately 6% of observations for U.K. data have robust residuals with magnitudes greater than 3, a standard cutoff for classifying an observation as an outlier in the response direction.

Generalized Maximum Likelihood estimation or M-estimation (Huber 1973) is an effective technique for detecting outliers and for estimating a regression that is robust to the influence of outliers in the response direction. It is not robust to outliers in the covariate space (independent variables), but diagnostics indicate that these are not a problem in our dataset. The variant of M-estimation that we use is briefly described here.

In a regression of response *y* on covariate matrix *X* with *N* observations and *p* parameters, the Huber M estimator $\hat{\beta}_M$ of β in $y = \beta X + \tilde{\varepsilon}$ is given by the solution to the following program:

$$\min_{\hat{\beta}} Q(\hat{\beta}) = \sum_{i=1}^{N} \rho(\frac{r_i}{\sigma}),\ r = y - X\hat{\beta}.$$

The function ρ is some appropriate function with several choices being available, while the parameter σ is called the scale parameter. This is equivalent to solving the following system of *p* equations:

$$\sum_{i=1}^{n} \psi(\frac{r_i}{\sigma}) x_{ij} = 0, j = 1, \ldots, p.$$

Here $\psi = \rho'$. In practice, we define and use the weight function *w* defined as:

$$w(a) = \frac{\psi(a)}{a}.$$

Several choices of weight function are available. We use the bi-square weight function defined as follows:

$$w(a) = \begin{cases} \left(1 - \left(\frac{a}{4.685}\right)^2\right)^2 & , if\ |a| < 4.685 \\ 0 & otherwise \end{cases}$$

The parameter 4.685 is chosen so that the corresponding M-estimates have 95% asymptotic efficiency.

The iterated weighted least squares procedure (IWLS) proceeds in sequences of steps until convergence is achieved. Successive steps focus on improving the estimate of β or of σ. Precisely, if we use the notation $\hat{\beta}^{(m)}$ to refer to the estimate of β obtained by the iteration number *m*, and $\hat{\sigma}^{(m+1)}$ to refer to the estimate of σ obtained by the iteration number *m*+1, then we have:

$$\hat{\sigma}^{(m+1)} = median\left\{ \frac{\left| y_i - x_i^T \hat{\beta}^{(m)} \right|}{\Phi^{-1}(0.75)}, i = 1,...,N \right\}$$

Ordinary least squares regression is used to provide a starting point for iterations, and the convergence criterion used is based on the relative change in the coefficients.

The asymptotic covariance of the robust estimated coefficients is estimated by the following:

$$\hat{\Omega} = K^2 \frac{\frac{1}{(N-p)} \sum \psi(r_i)^2}{\frac{1}{N} \sum \psi'(r_i)^2} \left(X^T X\right)^{-1}.$$

Here $K = 1 + \frac{p}{N}\frac{\mathrm{var}(\psi')}{(E\psi')^2}$. The reported confidence intervals for estimated coefficients are computed from the diagonal elements of $\hat{\Omega}$.

For overall goodness-of-fit of the IWLS, we report a robust version of the R-squared statistic, computed as follows:

$$R^2 = \frac{\sum \rho\left(\frac{y_i - \hat{\mu}}{\hat{\sigma}}\right) - \sum \rho\left(\frac{y_i - x_i^T \hat{\beta}}{\hat{\sigma}}\right)}{\sum \rho\left(\frac{y_i - \hat{\mu}}{\hat{\sigma}}\right)}.$$

Here $\rho' = \psi$ corresponding to *w* bi-square, $\hat{\beta}$ and $\hat{\sigma}$ are the M-estimators of the coefficient vector and the scale parameter respectively, and $\hat{\mu}$ is the M-estimator of location. To test against the null hypothesis $H_0 : \beta_j = 0$ for some parameter indexed by *j*, we report a robust Wald statistic given by:

$$R_n^2 = \left(\frac{N\hat{\beta}_j}{\hat{\Omega}_{jj}}\right)^2$$

This test statistic is asymptotically distributed as chi-squared with degrees of freedom 1. The program used to implement the IWLS procedure is the “ROBUSTREG” procedure in SAS 9.1 with default options (The SAS Institute 2004).

TABLE 1

Descriptive Statistics for the U.K. Sample (N=1628)

Variable	**Mean**	**Median**	**Std. Dev.**	**25%**	**75%**
PRICE	2.98	1.92	7.51	0.90	3.54
NOA	2.17	0.77	12.64	0.28	1.69
NFA	-0.08	-0.00	2.33	-0.25	0.12
$EARN_t$	0.75	0.14	7.86	0.05	0.26
REC	-0.03	-0.00	0.18	-0.02	0
UNREC	-0.07	-0.00	0.61	-0.04	0
Year Dummies					
Y93	0.12	0	0.32	0	0
Y94	0.13	0	0.33	0	0
Y95	0.14	0	0.35	0	0
Y96	0.18	0	0.38	0	0
Y97	0.24	0	0.43	0	0
Y98	0.20	0	0.40	0	0
Industry dummies					
SHARPE1	0.06	0	0.23	0	0
SHARPE2	0.22	0	0.41	0	0
SHARPE3	0.12	0	0.32	0	0
SHARPE4	0.52	1	0.50	0	1
SHARPE5	0.02	0	0.15	0	0
SHARPE6	0.06	0	0.24	0	0

Notes to Table 1:

Sample selection

The final sample of 1628 firm-years was obtained as follows: Deferred tax footnote data was collected from full-text UK financial statements on WORLDSCOPE or other sources where necessary and possible, for 3475 firm-years between 1993 and 1998. After restricting the sample to firms belonging to Sharpe industries 1-6 as defined below (following Amir *et al*. 1997, Sharpe 1982), we have 2168 firm-years. After removing firm-years with insufficient price or financial statement data on Compustat Global, we have 1628 observations.

Variable Definitions

PRICE, P_t, is calculated using the closing share price for an ordinary share at the year *t* balance-sheet date.

All financial statement variables are expressed as per-share numbers, using the number of common shares outstanding at balance-sheet date. The unit is the GBP. Attention was restricted to firms that report in GBP.

NFA_t, Net financial assets is calculated by netting off the sum of cash and cash equivalents and investments against the sum of long term debt (including its current portion) and preferred stock. This is expressed on a per-share basis.

NOA_t, Net operating assets is calculated as the book value of shareholders' fund minus the sum of provided deferred tax (REC_t) and our proxy for net financial assets (NFA). This is expressed on a per-share basis.

REC_t and $UNREC_t$ are the recognized deferred tax liability and the unrecognized portion reported in footnotes respectively. These are expressed on a per-share basis.

EARN, Actual operating income is calculated as reported basic earnings-per-share (excluding extraordinary items) net of tax-adjusted interest income and expense per share.

Y93 – Y98: These are dummy variables indicating that the observation is for the corresponding year from 1993 to 1998, e.g., Y93 is 1 if the observation refers to the year 1993 and 0 otherwise.

SHARPE1 – SHARPE6: These are dummy variables indicating membership of a Sharpe Industry Code (cf. Sharpe 1982; Amir *et al*. 1997). Following Amir *et al*. (1997) we restrict the sample to firms from the Sharpe industries 1-6 defined as follows:

SHARPE1: Membership of Sharpe Industry Group 1 (Basic Industries) defined as firms with four-digit SIC industry codes 1000-1299, 1400-1499, 2600-2699, 2800-2829, 2870-2899, 3300-3399;

SHARPE2: Membership of Sharpe Industy Group 2 (Capital Goods) defined as firms with four-digit SIC industry codes 3400-3419, 3440-3599, 3670-3699, 3800-3849, 5080-5089, 5100-5129, 7300-7399;

SHARPE3: Membership of the Sharpe Industry Group 3 (Construction) defined as firms with four-digit SIC industry codes 1500-1599, 2400-2499, 3220-3299, 3430-3439, 5160-5219;

SHARPE4: Membership of the Sharpe Industry Group 4 (Consumer goods) defined as firms with four-digit SIC industry codes 0000-0999, 2000-2399, 2500-2599, 2700-2799, 2830-2869, 3000-3219, 3420-3429, 3600-3669, 3700-3719, 3850-3879, 3880-3899, 4830-4899, 5000-5079, 5090-5099, 5130-5159, 5220-5999, 7000-7299, 7400-9999;

SHARPE5: Membership of the Sharpe Industry Group 5 (Energy) defined as firms with four-digit SIC industry codes 1300-1399, 2900-2999;
SHARPE6: Membership of the Sharpe Industry Group 6 (Transportation) defined as firms with four-digit SIC industry codes 3720-3799, 4000-4799.

TABLE 2
Pair-wise Correlations between Variables Included in the U.K. Regressions (N=1628)

	Price	NOA	NFA	EARN	REC	UNREC
Price		0.30***	0.01	-0.03	-0.04*	-0.04*
NOA	0.57***		0.40***	0.11***	-0.09***	-0.72***
NFA	-0.03**	-0.40 ***		0.11***	0.10***	-0.32***
EARN	0.75***	0.61***	-0.14 ***		0.02	-0.03
REC	-0.15 ***	-0.25 ***	0.10***	-0.20 ***		0.10***
UNREC	-0.27 ***	-0.43 ***	0.21***	-0.30 ***	0.22***	

Notes to Table 2:

The correlations in the shaded area are pair-wise Spearman rank correlations, while those in the un-shaded area are pair-wise Pearson correlations.

*,**,*** denote two-tailed significance at the 10%, 5% and 1% levels respectively.

Variable definitions as in Table 1

TABLE 3

Regression of Price on Components of Book Value Per Share for U.K. firm-years following the Model in Feltham and Ohlson (1995): Dependent Variable is PRICE. Entries are OLS coefficient estimates with t-statistics in parentheses (except R-squared in last row).

Regressor	[1] OLS with no control of outliers (N=1628)	[2] OLS after winsorizing price at 2 standard deviations (N-1628)	[3] OLS after removing points with Cook's distance > 4/N (N=1598)	[4] OLS after removing points with absolute studentized residuals > 1.96 (N=1608)
Intercept	2.54 (3.28***)	2.37 (7.71***)	1.74 (7.61***)	2.16 (9.27***)
NOA	0.37 (18.15***)	0.04 (5.40***)	0.91 (27.62***)	0.58 (19.06***)
NFA	-0.37 (-4.61***)	-0.09 (-2.78***)	0.83 (12.27***)	0.41 (6.11***)
EARN	-0.07 (-2.97***)	0.02 (2.83***)	0.01 (0.41)	0.01 (0.69)
REC	-0.39 (-0.41)	-1.20 (-3.20***)	-0.12 (0.86)	0.84 (2.79***)
UNREC	4.53 (11.22***)	0.20 (1.25)	1.35 (3.40***)	2.25 (5.58***)
Y93	-0.31 (-0.49)	0.39 (1.57)	0.32 (1.73*)	0.39 (2.07**)
Y94	-0.24 (-0.40)	0.20 (0.83)	0.16 (0.88)	0.23 (1.25)
Y95	0.17 (0.28)	0.55 (2.35**)	0.51 (2.95***)	0.45 (2.52**)
Y96	-0.02 (-0.04)	0.40 (1.80*)	0.44 (2.69***)	0.39 (2.34**)
Y97	-0.12 (-0.22)	0.42 (2.09**)	0.40 (2.67***)	0.36 (2.34**)
SHARPE1	0.43 (0.43)	0.51 (1.32)	-0.21 (-0.76)	0.06 (0.19)
SHARPE2	-0.47 (-0.60)	-0.53 (-1.71)	-0.43 (-1.86*)	-0.63 (-2.68***)
SHARPE3	0.23 (0.27)	-0.36 (-1.08)	-1.11 (-4.45***)	-0.90 (-3.48***)
SHARPE4	-0.09 (-0.12)	0.02 (0.06)	-0.55 (-2.56**)	-0.57 (-2.57**)
SHARPE5	5.45 (4.14***)	0.13 (0.25)	-0.24 (-0.57)	-0.42 (-1.05)
R-squared	0.18	0.04	0.38	0.25

Notes to Table 3

*,**,*** denote two-tailed significance at 10%, 5% and 1% respectively.

Variable definitions are as in Table 1.

OLS results in column [1] are obtained using the entire sample of 1628 observations.

OLS results in column [2] are obtained after winsorizing the price distribution at two standard deviations on both sides of the mean.

OLS results in column [3] are obtained after removing observations that have a Cook's distance of greater than 4/N based on the regression reported in column [1].

OLS results in column [4] are obtained after removing observations that have studentized residuals with an absolute value of 1.96 or greater based on the regression reported in column [1].

TABLE 4

Regression of Price on Components of Book Value Per Share for U.K. firm-years following the Model in Feltham and Ohlson (1995): Dependent Variable is PRICE.

Regressor	OLS coefficient estimate (t-statistic in parentheses) N=1608	IWLS Coefficient estimates (chi-squared statistic in parentheses) N=1628	95% confidence interval for IWLS coefficients	
			Lower limit	Upper limit
Intercept	2.16 (9.27***)	1.35 (69.0***)	1.0309	1.6683
NOA	0.58 (19.06***)	1.04 (59929.2***)	1.0337	1.0504
NFA	0.41 (6.11***)	0.97 (3272.4***)	0.9359	1.0023
EARN	0.01 (0.69)	0.01 (4.7**)	0.0010	0.0190
REC	0.84 (2.79***)	0.87 (19.4***)	0.4837	1.2593
UNREC	2.25 (5.58***)	0.83 (96.7***)	0.6682	1.0009
Y93	0.39 (2.07**)	0.29 (4.7***)	0.0278	0.5435
Y94	0.23 (1.25)	0.11 (0.8)	-0.1396	0.3610
Y95	0.45 (2.52**)	0.35 (8.2***)	0.1115	0.5943
Y96	0.39 (2.34**)	0.34 (8.6***)	0.1125	0.5690
Y97	0.36 (2.34**)	0.32 (8.6***)	0.1046	0.5271
SHARPE1	0.06 (0.19)	-0.11 (0.3)	-0.5126	0.2983
SHARPE2	-0.63 (-2.68***)	-0.33 (3.9**)	-0.6469	-0.0033
SHARPE3	-0.90 (-3.48***)	-0.98 (30.2***)	-1.3266	-0.6289
SHARPE4	-0.57 (-2.57**)	-0.56 (13.3***)	-0.8569	-0.2583
SHARPE5	-0.42 (-1.05)	-0.74 (7.2***)	-1.2865	-0.2013
R-squared	0.25	0.23		

Notes to Table 4

*,**,*** denote two-tailed significance at 10%, 5% and 1% respectively.

Variable definitions are as in Table 1.

The OLS results reported after trimming observations that have studentized residuals with an absolute value greater than 1.96 in a full-sample OLS run.

The Iterative Weighted Least Squares results use Huber M-estimation, with the bi-square weight function with the parameter 4.685 and the median scale function described in Hampel *et al*. 1986, p.312.

The Chi-squared statistic reported for the IWLS estimated coefficients refers to the R^2_n test statistic described in Hampel at al. (1986) chapter 7.

The R-squared reported is the adjusted R-squared in the case of OLS, and a robust measure of R-squared in the case of IWLS.

TABLE 5

Regression of Price on Components of Book Value Per Share for U.K. firm-years following the Model in Feltham and Ohlson (1995), with control for cross-sectional variation in earnings magnitudes: Dependent Variable is PRICE.

Regressor	IWLS Coefficient estimates (chi-squared statistic in parentheses) N=1628	95% confidence interval for IWLS coefficients	
		Lower limit	Upper limit
Intercept	1.19 (55.30***)	0.88	1.50
NOA	1.03 (62880.7***)	1.03	1.04
NFA	0.96 (3401.91***)	0.92	0.99
EARN	3.90 (19.28***)	2.16	5.64
EARN* EARNMAG	-0.97 (19.09***)	-1.40	-0.53
REC	0.91 (22.85***)	0.54	1.29
UNREC	0.81 (97.14***)	0.65	0.97
Y93	0.24 (3.54*)	-0.01	0.49
Y94	0.06 (0.24)	-0.18	0.30
Y95	0.29 (5.96**)	0.06	0.52
Y96	0.29 (6.47**)	0.07	0.51
Y97	0.27 (6.83***)	0.07	0.48
SHARPE1	-0.10 (0.23)	-0.49	0.30
SHARPE2	-0.31 (3.74*)	-0.62	0.00
SHARPE3	-1.02 (35.03***)	-1.36	-0.68
SHARPE4	-0.55 (13.67***)	-0.84	-0.26
SHARPE5	-0.68 (6.45**)	-1.20	-0.16
R-squared	0.24		

Notes to Table 5

*,**,*** denote two-tailed significance at 10%, 5% and 1% respectively.

Variable definitions are as in Table 1 except EARNMAG, defined as the quintile of the absolute value of the EARN variable in the pooled sample. The expression EARN*EARNMAG refers to the interaction term between EARN and EARNMAG.

The OLS results reported after trimming observations that have studentized residuals with an absolute value greater than 1.96 in a full-sample OLS run.

The Iterative Weighted Least Squares results use Huber M-estimation, with the bi-square weight function with the parameter 4.685 and the median scale function described in Hampel *et al*. 1986, p.312.

The Chi-squared statistic reported for the IWLS estimated coefficients refers to the R^2_n test statistic described in Hampel at al. (1986) chapter 7.

The R-squared reported is the adjusted R-squared in the case of OLS, and a robust measure of R-squared in the case of IWLS.

TABLE 6

Regression of returns on components of changes in the book Value per share for U.K. firm-years: Dependent Variable is RETURN.

Regressor	OLS coefficient estimate (t-statistic in parentheses) N=1054	IWLS Coefficient estimates (chi-squared statistic in parentheses) N=1109	95% confidence interval for IWLS coefficients	
			Lower limit	Upper limit
Intercept	-0.09 (-0.96)	-0.14 (3.05*)	-0.30	0.02
DNOA	0.64 (9.50***)	0.52 (335.57***)	0.46	0.57
DNFA	0.61 (7.71***)	0.31 (77.34***)	0.24	0.38
DEARN	13.77 (10.26***)	13.53 (134.81***)	11.25	15.82
DEARN* DEARNMAG	-3.44 (-10.27***)	-3.38 (134.80***)	-3.95	-2.81
DREC	0.86 (1.55)	0.47 (20.66***)	0.27	0.67
DUNREC	-0.33 (-0.84)	0.09 (9.85***)	0.03	0.14
DPS	-0.61 (-3.35***)	-0.34 (146.92***)	-0.39	-0.28
Y94	0.05 (0.70)	0.06 (0.95)	-0.06	0.18
Y95	0.54 (8.01***)	0.48 (68.83***)	0.37	0.60
Y96	0.49 (7.38***)	0.46 (65.49***)	0.35	0.57
Y97	0.32 (5.04***)	0.29 (29.44***)	0.19	0.40
SHARPE1	-0.50 (-4.12***)	-0.39 (13.83***)	-0.59	-0.18
SHARPE2	-0.11 (-1.13)	-0.05 (0.43)	-0.22	0.11
SHARPE3	-0.31 (-3.06***)	-0.23 (6.56***)	-0.40	-0.05
SHARPE4	-0.16 (-1.77*)	-0.14 (3.31*)	-0.29	0.01
SHARPE5	-0.19 (-1.03)	0.01 (0.00)	-0.28	0.29
R-squared	0.27	0.15		

Notes to Table 6

*,**,*** denote two-tailed significance at 10%, 5% and 1% respectively.

Variable Definitions:

RETURN is the change in market capitalization from the previous year, deflated by the closing number of shares.
DNOA is the change in total net operating assets from the previous year, deflated by the closing number of shares.
DNFA in year *t* is the change in total net financial assets from the previous year, deflated by the closing number of shares.
DEARN in year *t* is the change in total operating income (as defined earlier) deflated by the closing number of shares.
DEARNMAG refers to the quintile of the absolute value of the DEARN variable.
DREC and DUNREC in year t are the changes in total recognized and unrecognized net deferred tax assets respectively, deflated by the closing number of shares.
DPS refers to the dividends per share in year *t*.

Other variables are as defined in Table 1.

R-squared in the OLS case is the adjusted R-squared, and in the IWLS case is as defined in the Appendix.

OLS is run after eliminating observations with Cook's distance > 4/N and student residuals > 1.96, where these diagnostics are calculated from an initial OLS run. Also, RETURN is winsorized at three standard deviations in the OLS run.