Book-Tax Differences, Analysts' Forecast Errors, and Stock Returns

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Abstract:

This paper addresses the question of whether market participants' expectations efficiently reflect the earnings quality implications of book-tax differences. Because investors' earnings expectations are not directly observable and predictable stock returns may reflect either risk or mispricing, this study exploits the forecasts of financial analysts. Results indicate that analysts' forecasts of subsequent earnings are more optimistically biased for firm-years where book income is relatively high compared to tax income, which is consistent with their forecasts failing to fully reflect the information in this signal. Further, analysts' errors appear to largely explain the previously documented association between book-tax differences and future stock returns. This result suggests that analysts' systematic errors proxy for similar, though not directly observable, errors made by investors and lends support to claims in prior research that investors' misperceptions of the implications of book-tax differences for future earnings lead to mispricing.

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I. INTRODUCTION

This paper examines whether market participants utilize the information in book-tax differences (BTDs) efficiently in forming their expectations of future earnings. This investigation is primarily motivated by findings in recent research that BTDs are associated with both future earnings outcomes and future stock returns (e.g., Lev and Nissim [2004], Hanlon [2005]). Given that investors' earnings expectations are not directly observable, the ability of BTDs to predict future returns that has been documented in prior research could be attributable to either risk or misvaluation. This study attempts to distinguish between these two competing explanations by employing the observable earnings forecasts of sell-side financial analysts. Specifically, this study first investigates whether BTD-related information is efficiently reflected in analysts' forecasts of future earnings. If forecasts are efficient with respect to BTDs, then errors in forecasts of future earnings should not be systematically related to current period BTDs that are known at the time of the forecasts. Second, this study addresses whether the previously documented relationship between current BTDs and future stock returns persists after controlling for analysts' forecast errors. A finding that analysts' observable errors explain the relation between current BTDs and future returns would suggest that investors make similar BTD-related errors in forming their expectations of future earnings, consistent with the misvaluation explanation.

Corporations compile records for both financial reporting and tax purposes, and BTDs are differences in the income measures derived under the two accounting systems. Because these two systems are applied to the same set of underlying economic events, the extent to which they differ should contain information useful in evaluating their implications for future performance. Accordingly, recent research reports that tax measures of income provide a useful benchmark for evaluating the quality of book earnings and that BTDs contain information useful for predicting future earnings (e.g., Hanlon [2005]). Moreover, Lev and Nissim [2004] find that future stock returns are also systematically related to current BTDs, leading to the conjecture that market participants fail to fully impound the implications of BTDs for future earnings into their expectations. However, the interpretation of predictable future returns as evidence of systematic errors in investors' expectations of future earnings faces two related challenges. First, investors' expectations of future earnings are not directly observable. Second, predictable future returns may be evidence of mispricing or may simply reflect differences in risk that are not fully understood and thus are not fully captured by asset pricing models (i.e., the "joint-hypothesis problem"; Fama [1991], Kothari [2001]). Therefore, the evidence in prior research alone cannot support the conclusion that investors systematically misinterpret BTD-related information in forming their expectations.

This study overcomes these obstacles by exploiting the published earnings forecasts of financial analysts. I first test the relation between current period BTDs and analysts' errors in forecasting future earnings. Results indicate that analysts' forecasts do not efficiently reflect the earnings quality implications of BTDs, in that their errors in forecasting future earnings are a function of current period BTDs. Specifically, I find that analysts' forecasts display greater optimistic bias for firm-years where book income is higher relative to tax income. Given that higher book income relative to tax income tends to signal less favorable future earnings outcomes, this result is consistent with analysts failing to fully incorporate BTD information into their expectations of future earnings. To determine whether the BTD-related errors in analysts' expectations proxy for similar, but unobservable, errors made by investors, I then reexamine the relation between BTDs and future returns after controlling for analysts' forecast errors. Results from these tests demonstrate that BTDs are no longer predictive of future returns after controlling for the errors in analysts' forecasts, indicating that investors make similar systematic errors in their expectations when setting prices. This outcome is consistent with the misvaluation explanation.

This research makes several contributions. First, recent work documents associations between BTD-related information and future earnings realizations (Lev and Nissim [2004] and Hanlon [2005]). My study compliments this work by documenting that both financial analysts and investors fail to fully incorporate this information into their expectations of future earnings. Second, a separate stream of inquiry investigates whether analysts' earnings forecasts reflect various types of information efficiently (e.g., Mendenhall [1991], Abarbanell and Bushee [1997]). The result that analysts' errors are systematically related to BTDs that are available at the time of their forecasts indicates that their forecasts fail to efficiently reflect this information. Third, other research seeks to link reported market anomalies with inefficiencies in analysts' forecasts (e.g., Bradshaw et al. [2001], Shane and Brous [2001], Bradshaw et al. [2006]). Similarly, a motivation for my work is prior research reporting the predictability of future returns based on current BTDs (Lev and Nissim [2004]). My results indicate that analysts' observable BTD-related errors effectively proxy for similar errors made by investors in forming their expectations. These results lend support to the conjecture that investors' misperceptions of the implications of BTDs for future earnings lead to mispricing.

The remainder of this paper is organized as follows. The next section highlights related literature. Section III develops the research questions and Section IV describes the sample employed in the empirical tests. Section V discusses the research design and primary results. Section VI presents additional analyses and sensitivity tests, and Section VII concludes.

II. RELATED RESEARCH

Recent research provides evidence that BTDs can signal earnings quality. Phillips et al. [2003] find that BTDs are associated with firms meeting or slightly beating certain earnings targets, which they interpret as evidence of BTDs being a signal of potential earnings management. Hanlon [2005] examines the persistence of earnings in the presence of BTDs and demonstrates that large differences are associated with less-persistent pre-tax earnings. Lev and Nissim [2004] use future earnings growth as an operational measure of earnings quality and develop a measure of BTDs that is intended to capture differences in after-tax measures of book and tax income. Their "tax-based fundamental" is the ratio of estimated net tax income to net book income. They hypothesize and find that higher ratios of net tax income to net book income are associated with higher levels of future earnings growth. They also report a positive relation between their BTD measure and future stock returns, leading to the conjecture that investors underappreciate the value of this ratio as a signal of future performance. I extend this research by utilizing the earnings forecasts of financial analysts to test whether their observable expectations contain systematic errors related to BTDs and, further, whether any such errors proxy for similar, though unobservable, systematic errors on the part of investors.[1]

My work is also related to previous research that considers the efficiency with which analysts and investors utilize financial statement information in forecasting future earnings (see Ramnath et al. [2006] for a recent survey). Abarbanell and Bushee [1997, 1998] examine several

[1] Hanlon [2002] includes some discussion of analysts' interpretation of temporary BTDs as well. My work is distinct in that I focus on the more comprehensive differences in after-tax measures of income, as opposed to just temporary differences (which represent one category of total BTDs), I present formal multivariate analyses, and I investigate the association between BTDs and future returns conditioned on analysts' errors. Plumlee [2003] also studies analysts in a tax-related context, but her focus is on analysts' responses to tax legislation, rather than the efficient use of an earnings quality signal, and does not address investors' expectations. In addition, her study is based on forecasts of effective tax rates rather than forecasts of earnings per share, which is particularly important in my context given that recent research demonstrates associations between BTD and the quality of the pre-tax component of earnings that would not be reflected in effective tax rates (e.g., Phillips et al. [2003], Hanlon [2005]).

signals common in financial statement analysis and find that some signals are not efficiently reflected in analysts' or investors' expectations. Investigating the earnings quality implications of accruals, Bradshaw et al. [2001] and Teoh and Wong [2002] find that analysts' forecasts contain predictable errors related to the accrual portion of earnings from the prior year and interpret the result as evidence supporting accrual-related mispricing. Abarbanell and Bernard [1992] and Shane and Brous [2001] investigate analysts' forecasts in the context of post-earnings announcement drift, finding that analysts make similar, but smaller, mistakes than investors. Motivated by the results that BTDs are related to both future earnings and future stock returns, my work provides evidence on whether analysts and investors make systematic BTD-related errors in their earnings expectations, which would be consistent with the misvaluation explanation.

III. RESEARCH QUESTIONS

The first objective of this study is to evaluate whether analysts impound information related to BTDs into their forecasts efficiently. While prior research indicates that BTDs contain information that should be useful for predicting future earnings, it also suggests the possibility that the implications of BTDs may not be fully reflected investors' expectations when setting security prices. In particular, Lev and Nissim [2004] report that their tax-to-book signal predicts future returns. Since investors' earnings expectations are not directly observable, I first examine analysts' earnings forecasts. Prior research demonstrates that forecast accuracy is important to analysts (e.g., Mikhail et al. [1999]), and thus analysts have incentives to use relevant information, such as BTDs, in forming their forecasts. However, prior research also suggests that there may be limits to analysts' abilities to use all available information.[2] If analysts' forecasts efficiently reflect the earnings quality implications of BTDs, then there should be no relation between their forecast errors and BTD information that is available at the time of the forecasts. However, if analysts' forecasts fail to fully impound the information in BTDs related to future earnings, then their errors will be related to current period BTDs. Accordingly, my first research question is whether analysts' errors in predicting future earnings are associated with current year BTDs.

To the extent that analysts' forecasts proxy for the market's expectations of earnings, a finding that BTDs are related to subsequent forecast errors would lend support to Lev and Nissim's [2004] conclusion that during their sample period "not all of the forward-looking information in the tax fundamentals was captured in contemporaneous stock prices" (p. 1065), as opposed to their results being driven by some mismeasured or omitted risk factor. The second phase of the study examines this issue more directly.

While the initial research question addresses whether the information contained in BTDs is efficiently reflected in analysts' forecasts, the remainder of this study seeks to link any systematic BTD-related errors in analysts' forecasts more directly to the predictability of future returns, in effort to further differentiate between the misvaluation and risk explanations. The objective of this analysis is to determine the extent to which errors in analysts' published earnings forecasts reflect similar errors in investors' expectations. Since investors' earnings expectations are not directly observable, they must be inferred from stock price movements, and the research design takes this into account. If investors do misinterpret the information in BTDs that is relevant for predicting future earnings and analysts' BTD-related forecast errors proxy for

[2] For example, Plumlee [2003] argues that complex information is costly to incorporate into forecasts. The accounting for income taxes is frequently cited as one of the most complex areas of financial reporting (e.g., Gleckman et al. [2000]).

similar errors in investors' expectations, then BTDs will begin to lose their predictive ability for returns once conditioned on analysts' forecast errors. Accordingly, the second research question is whether systematic errors in analysts' earnings expectations explain the relation between current period BTDs and future returns. An affirmative answer would support the misvaluation explanation.

Comparing the magnitude of predictable future returns based on current period BTDs before and after controlling for analysts' forecast errors also supplies a measure of the degree to which analysts' errors represent similar errors on behalf of investors. For inefficiencies in analysts' earnings forecasts to represent a full explanation of the market's alleged inefficiencies, two conditions must hold. First, analysts' forecast errors must have a systematic component that is related to BTDs (the first research question examines this possibility). Second, BTDs should no longer have incremental predictive power for future returns after controlling for the inefficiencies in analysts' forecasts. Conversely, if analysts' subsequent forecast errors fail to subsume current period BTDs in predicting future returns (i.e., current period BTDs continue to be associated with future returns after controlling for analysts' forecast errors), then analysts' and investors' expectations differ and analysts' behavior represents a less-than-complete explanation for the predictability of future returns documented in previous research.

IV. SAMPLE SELECTION AND DESCRIPTIVE STATISTICS

The initial sample is drawn from all U.S. firm-years with the necessary information available in the Compustat files from 1984 to 2003 and with corresponding forecasts for the subsequent years' earnings available in the I/B/E/S Detail History file. I use the Detail History file to create my own consensus forecasts, rather than using the Summary History file, to avoid the problem of stale forecasts being included in the consensus (e.g., Ramnath et al. [2005]). I focus on forecasts of one-year-ahead earnings, as opposed to longer-horizon earnings forecasts or long term growth forecasts, for two reasons. First, the appropriate benchmark with which to evaluate long term growth forecasts is unclear. According to I/B/E/S, these forecasts represent a variety of definitions and time periods, and they are not standardized (i.e., there is no clear "actual" from which a forecast error can be determined). Second, longer-horizon earnings forecasts are not as common as one-year-ahead forecasts and require longer time series of data for each firm-year, thus leading to sample attrition and potential survival bias.

For purposes of constructing consensus forecasts, for each firm-year I create a series of 30-day forecasting periods anchored on the release of the base years' (year t's) earnings information. I then calculate the consensus forecast for each firm-year-forecasting period combination as the median of all individual forecasts (for year t+1 earnings) for that particular firm during that 30-day block.[3] In cases where the same analyst has issued multiple forecasts for the same firm during the same 30-day block, I use only the latest forecast from that analyst in calculating the consensus. To mitigate the influence of data-coding errors and extreme observations, prior to forming consensus forecasts I eliminate any individual forecasts in the highest and lowest 1% of the distribution of price-scaled forecast errors.[4] The initial sample contains 27,800 firm-years with at least one forecast available for the subsequent year's earnings. For the primary empirical analyses, I focus on two particular forecasting periods: the first and fifth 30-day blocks subsequent to the release of year t earnings ('month 1' and 'month 5,' respectively). I choose month 1 because it is the earliest time period subsequent to the release of year t earnings and analysts' access to other information related to year t+1 earnings (e.g.,

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[3] For example, consider a calendar year company that releases their 2001 (year t) earnings on January 20, 2002. The first consensus forecasting period would then include all forecasts of 2002 (year t+1) earnings made from January 21 to February 19, 2002. The second 30-day forecasting period would be from February 20 to March 21, 2002 and so on.

[4] Inferences are unaffected if these extreme individual forecasts are included when forming the consensus forecasts.

quarterly earnings) is minimized. I also conduct the analyses using month 5 forecasts to ensure that analysts have access to all relevant information from the year t annual report.[5] To keep a consistent set of firm-years across forecast months, I restrict the sample to those observations with forecasts available in both month 1 and month 5. This screen reduces the sample to 16,637 firm-years. I exclude financial services and utilities (1,122 firm-years) because these regulated firms face different reporting environments and firms with non-positive earnings before extraordinary items (2,617 firm-years) in order to keep the ratio of net tax income to net book income meaningful. After applying these screens, the sample consists of 12,898 firm-years.

Sample observations are then partitioned based on BTDs. Motivated by Lev and Nissim's [2004] finding that the ratio of net tax income to net book income is positively related to both future earnings changes and future returns, I adopt a similar measure as my primary variable of interest.[6] More specifically, I calculate TAX as the ratio of net tax income to net book income, where net tax income is estimated as $\frac{CTE}{\tau} \times (1-\tau)$, τ is the U.S. statutory corporate tax rate and CTE is current tax expense. CTE is measured as the sum of current federal (Compustat #63) and foreign (#64) income taxes, or, when either of these amounts is missing, as total income tax expense (#16) less total deferred tax expense (#50). Net book income is earnings before extraordinary items (#18). Firm-years are then ranked into deciles by year,

[5] Month 1 and month 5 are chosen on the conceptual basis described above. However, inferences are not sensitive to using other time periods.

[6] While much of the literature has chosen to focus on particular categories of differences in book and tax income measurements (e.g., Phillips et al. [2003] focus on temporary differences, Frank et al. [2006] focus on permanent differences, Krull [2004] focuses on differences stemming from permanently reinvested foreign earnings), Lev and Nissim [2004] argue that their comprehensive measure of BTDs provides a more powerful indicator of earnings quality. They also argue that an additional advantage of an after-tax measure of BTDs is that the effects of "tax accruals" (i.e., discretionary adjustments to book income tax expense such as changes in deferred tax asset valuation allowance, tax cushions and permanently reinvested foreign earnings) on financial statement amounts are difficult to separate from those of temporary differences and permanent differences. For example, deferred tax expense—which is typically used to estimate temporary differences—may also be affected by changes in the deferred tax asset valuation allowance (see also Phillips et al. [2004]). A more detailed discussion of the conceptual and empirical formulation of the TAX ratio and the associated potential for measurement error is available in the appendix. As an empirical matter, my results are qualitatively similar (though in some cases slightly weaker) using pre-tax measures of book and tax income.

based on the value of the TAX ratio.[7] I denote the decile rankings of TAX by rTAX. While estimates of taxable income from financial statement disclosures are subject to some known estimation errors (see, for example, Hanlon [2003] or McGill and Outslay [2002, 2004] for related discussions), from a forecasting or valuation perspective, these estimates are more appropriate than actual taxable income amounts because tax return information is not publicly available to market participants (Hanlon and Shevlin [2005]). Nevertheless, in Section VI below I perform additional analyses aimed at ruling out the most common potential sources of measurement error in the estimate of net tax income as drivers of the primary results.

Table 1 presents descriptive statistics on key variables used in the analyses.[8] Panel A shows that forecast errors for forecasts from both month 1 ($FError^{M1}$) and month 5 ($FError^{M5}$) are negative at the mean and median, consistent with general optimism (similar to Bradshaw et al. 2001, forecast errors are constructed as actual earnings minus the forecast of those earnings, scaled by month 1 stock price). Further, the forecast errors from month 5 tend to be less negative than those from month 1, consistent with decreasing optimism as the forecast horizon shrinks (Richardson et al. [2004]). The mean and median value for TAX are both slightly less than one, indicating that the typical sample firm has net tax income that is slightly lower than net book income. Consistent with prior research (e.g., Dechow [1994]), mean and median accruals (ACC) are negative. Panel B provides correlations between the variables. Of interest for the current study, forecast errors are positively associated with rTAX, consistent with the possibility of BTD-related inefficiencies in analysts' forecasts. Consistent with previous research, forecast

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[7] I perform the rankings by year to help ensure that there are sufficient observations to make the rankings meaningful. However, inferences are unchanged by additionally ranking on month of fiscal year-end, industry (2-digit SIC), or both.

[8] Variables are winsorized at the top and bottom 1% of their respective distributions. The forecast error variables ($FError^{M1}$ and $FError^{M5}$) are not winsorized because outlier individual forecasts have already been vetted in the process outlined above prior to forming consensus forecasts.

errors are negatively associated with accruals (Bradshaw et al. [2001]) and positively associated with firm size (SIZE) (Brown [1997]), market-to-book ratio (MB) (Brown [2001]), changes in analyst following (ΔFOL) (Teoh and Wong [2002]) and forecast errors from the previous year (PYFE) (Abarbanell and Bernard [1992]).[9]

INSERT TABLE 1 ABOUT HERE

Table 2 presents results from five simple, univariate regressions intended to provide a descriptive first look at the associations between BTDs from year t and the actual and forecasted changes in earnings per share from year t to year t+1. In each model rTAX is the sole independent variable. The first model, with change in earnings per share scaled by price as the dependent variable, confirms that rTAX contains information on earnings quality as higher values of rTAX are associated with more favorable future earnings changes. Using forecasts from month 1 and month 5, respectively, the dependent variable in the second and third models is the forecasted change in earnings from year t to year t+1 that is implicit in analysts' forecasts of year t+1 earnings (i.e., forecasted year t+1 earnings minus actual year t earnings, scaled by price). The results from the second and third regressions suggest that analysts' implicit forecasts of earnings changes are unrelated to rTAX as the coefficients on rTAX are statistically indistinguishable from zero in both cases. The fourth and fifth regressions summarize the results from the previous three by regressing analysts' price-scaled errors in forecasting future earnings on rTAX. The results from estimating these relations are consistent with BTD-related

[9] Some of the correlations are relatively high—particularly between firm size and market-to-book—raising the possibility of multicollinearity issues in the multiple regression analyses that follow. However, examination of variance inflation factors for each of the regression models reveals that in no case does any variable have a variance inflation factor above 3.0, suggesting that multicollinearity is not a problem.

inefficiencies in analysts' forecasts as there is a positive and significant relation between rTAX from year t and errors in forecasts of year t+1 earnings. In sum, these estimates suggest that, while BTDs contain information related to future earnings changes, this information does not appear to be reflected in analysts' forecasts of those changes, and thus this unused information leads to predictable forecast errors. The next section examines this result more formally.

INSERT TABLE 2 ABOUT HERE

V. RESEARCH DESIGN AND RESULTS

Book-Tax Differences and Errors in Analysts' Expectations

In this section I present tests of the relation between BTDs and errors in analysts' forecasts of subsequent earnings using a model that controls for various other factors known to be associated with forecast errors. As described above, forecast errors are calculated as actual year t+1 earnings (as reported by I/B/E/S) minus the forecast of those earnings, scaled by the month 1 stock price.[10] The primary independent variable of interest is rTAX and I again focus on forecast errors from month 1 and month 5 (the remaining variables are discussed below):

$$\begin{aligned} FError_{i,t+1} = {} & \alpha + \beta_1 rTAX_{i,t} + \beta_2 SIZE_{i,t} + \beta_3 MB_{i,t} + \beta_4 \Delta FOL_{i,t+1} + \beta_5 PYFE_{i,t} \\ & + \beta_6 ACC_{i,t} + \sum_t \beta_{7,t} YEAR_t + \varepsilon_{i,t+1} \end{aligned} \quad (1)$$

Where $FError_{i,t+1}$ = firm i's actual t+1 earnings minus the consensus forecast of those earnings, scaled by month 1 stock price.

$rTAX_{i,t}$ = firm i's decile ranking based on the ratio of estimated net tax income to net book income from year t, scaled to range between [0, 1].

$SIZE_{i,t}$ = natural log of firm i's market capitalization at the end of year t.

[10] While deflating by price is common in the literature, Cohen and Lys [2003] argue that stock price may be correlated with other factors, suggesting the usefulness of testing other options. Accordingly, I re-evaluate the results using forecast errors deflated by the absolute value of realized t+1 earnings, and forecast errors deflated by the absolute value of the corresponding consensus forecast. Inferences are unchanged for both alternative definitions of forecast errors.

$MB_{i,t}$	=	ratio of market capitalization to book value of common equity for firm i at the end of year t.
$\Delta FOL_{i,t+1}$	=	the change in the number of unique analysts making earnings forecasts for firm i from year t to year t+1, divided by the number from year t.
$PYFE_{i,t}$	=	firm i's actual year t earnings minus the median individual forecast of those earnings from midyear (month 6) of year t, scaled by stock price.
$ACC_{i,t}$	=	the ratio of firm i's accruals to net income for year t.[11]
$YEAR_t$	=	dummy variables that indicate the various base years within the sample (i.e., there is one YEAR variable corresponding to each of the years 1985-2003).

If analysts incorporate the signal about future earnings from rTAX into their forecasts, then their forecast errors should not be a function of rTAX. If, however, analysts' forecasts fail to fully reflect that firms with low TAX ratios tend to have less favorable future earnings outcomes, then their forecast errors will be more negative (i.e., more optimistic) for these firms, leading to a positive relation between forecast errors and rTAX.

Prior research (e.g., Brown [1997]) has found that larger firms tend to have fewer negative earnings surprises (i.e., a positive relation between firm size and forecast errors), and I include a size control, accordingly. Similar to Teoh and Wong [2002] and Richardson et al. [2004], I calculate SIZE as the natural log of market capitalization at the end of year t. I also include a control for the market-to-book ratio (MB) as Brown [2001] and Matsumoto [2002] report that growth firms tend to have less negative earnings surprises.

McNichols and O'Brien [1997] argue that analysts prefer to cover firms that they believe have promising outlooks. Since firms with lower TAX ratios tend to have less favorable future earnings outcomes, it is possible that some analysts anticipate this outcome and decide to discontinue their coverage, leaving only the more optimistic analysts to remain publishing

[11] Following Lev and Nissim [2004], I measure accruals as (ΔCurrent Assets - ΔCash) - (ΔCurrent Liabilities - ΔDebt included in current liabilities) - ΔDeferred Tax Liability – Depreciation = (ΔCompustat #4 - Δ#1) - (Δ#5 - Δ#34) - Δ#35 - #14. I use balance sheet information to measure accruals because the beginning of my sample period predates the implementation of SFAS 95 in 1988 (SFAS 95 governs preparation of the statement of cash flows). However, inferences are unaffected if I restrict the sample to the post-SFAS 95 period and use Bradshaw et al.'s [2001] measures of total accruals or working capital accruals, which are both based on information from the statement of cash flows.

forecasts and thus inducing an optimistic bias in the set of observable expectations. To control for this possibility, I include an additional variable aimed at capturing the effects of changes in analyst following (ΔFOL), which is measured as the number of unique analysts making earnings forecasts for firm i during year t+1 minus the corresponding number from year t, scaled by the number from year t.

I also control for forecast errors from the previous year as Abarbanell and Bernard [1992] demonstrate a positive serial correlation in analysts' forecast errors. Following Teoh and Wong [2002], I define $FError^{PY}$ as the year t forecast error for firm i, based on the consensus forecast from mid-year (month 6) of year t.[12] Bradshaw et al. [2001] report that forecast errors are negatively related to accounting accruals and conclude that analysts' forecasts are inefficient with respect to the information in the accruals. Accordingly, I also include a control for the accrual portion of earnings (ACC). Finally, because prior research (e.g., Brown [2001]) suggests that forecast errors have changed over time, I include year dummies to control for any time-specific component of forecast errors.

Table 3 presents the results of estimating (1). The estimated coefficients on rTAX are positive and highly statistically significant for both month 1 and month 5, indicating that the over-optimism in analysts' forecasts is significantly greater for firms with lower ratios of tax to book income. This result is consistent with analysts failing to fully incorporate the relation between rTAX and future earnings into their forecasts. Estimated coefficients for the control variables are consistent with the prior research outlined above. Looking across months, the estimated coefficients on all variables for month 5 are smaller in absolute magnitude than the corresponding amounts for month 1. This is expected, given that analysts tend to become more

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[12] In addition to controlling for the effect reported by Abarbanell and Bernard [1992], Teoh and Wong [2002] argue that using the previous years' forecast error can serve as an instrument for other unidentified factors potentially missing from the analysis.

accurate over shorter forecasting horizons as they accumulate additional sources of information (e.g., quarterly earnings).

INSERT TABLE 3 ABOUT HERE

To help provide economic meaning for the Table 3 results, consider the typical sample firm has a price-to-earnings ratio of about 20. Using the estimated coefficient on rTAX for month 1 (0.0086), and the assumed price-to-earnings ratio of 20, the average month 1 forecast for firms in the lowest rTAX group would be more over-optimistic than the corresponding forecast for firms in the highest rTAX group by about 17.2% of earnings (0.0086 × 20).

In sum, the results in Table 3 indicate that analysts' forecasts fail to fully reflect the implications of BTDs for future earnings and are consistent with the possibility of BTD-related errors in expectations leading to predictable future stock returns. The following section investigates this possibility more closely by testing whether the BTD-related errors in analysts' expectations proxy for similar errors on behalf of investors.

Do Inefficiencies in Analysts' Forecasts Explain the Relation Between Book-Tax Differences and Future Returns?

After finding evidence of BTD-related inefficiencies in analysts' earnings forecasts, I next examine the degree, if any, to which those inefficiencies explain the relation between BTDs and future returns in Lev and Nissim [2004].[13] The goal of this analysis is to determine the

[13] Lev and Nissim split their sample into two time periods (1973-1992 and 1993-2000) corresponding to before and after the implementation of SFAS 109. Initially, they find that during the 1973-1992 time period firms with higher TAX ratios earn higher returns over the subsequent year, but that this result is not significant for the 1993-2000 time period as a whole. However, further investigation reveals that the insignificance in the later time period is driven by the year corresponding to the height of the tech bubble (many of these technology firms were reporting little or no taxable income, thus perhaps inducing a negative correlation between the TAX ratio and returns). In separate analyses, they also show that returns were significant in the 1993-2000 period after excluding 1) firms with small earnings-to-price ratios, and 2) firms with high long-term growth forecasts. They interpret the sum of this evidence

extent to which analysts' systematic errors represent similar errors in investors' expectations that are related to BTDs. Finding that analysts' errors explain the relation between current period BTDs and future returns would be consistent with the misvaluation explanation.

For the tests in this section I use a method similar to Shane and Brous [2001], who investigate post-earnings announcement drift. The analysis here unfolds in two stages. In the first stage I estimate the relation between rTAX and future returns, essentially replicating prior results using my sample. In the second stage I include analysts' forecast errors in the model to measure the ability of those errors to explain the relation between rTAX and future returns. Intuitively, if BTDs predict future returns because investors make systematic errors in their earnings expectations similar to those made by analysts, then once analysts' forecast errors are controlled, the relation between rTAX and future returns should approach zero.

More formally, I first estimate

$$SAR_{i,t+1} = \alpha + \beta_1 rTAX_{i,t} + \varepsilon_{i,t+1} \quad (2)$$

using the Fama and MacBeth [1973] approach of estimating a series of annual regressions in order to control for cross-correlation in the residuals. The sample is restricted to firms with December fiscal year-ends so that the return periods coincide and the information necessary to form the rTAX portfolios is available prior to the beginning of the return periods (e.g., Schmidt [2006]). $SAR_{i,t+1}$ is the size-adjusted annual buy-hold return from May 1 of year t+1, calculated as the raw annual return minus the return on the corresponding size decile portfolio from the CRSP database.[14] The holding period begins May 1 of year t+1 to ensure that market

as indicating that their tax-based signal continued to predict abnormal returns over the 1993-2000 period, with the exception of firms involved in the market bubble.

[14] For any firms that delist during the subsequent return period, proceeds from the issue are invested in the CRSP value-weighted index until the end of the holding period.

participants have access to financial statement data for year t. The estimate of β_1 from (2) then supplies an initial measure of future abnormal returns related to BTDs.

I next estimate

$$SAR_{i,t+1} = \alpha + \beta_1 rTAX_{i,t} + \beta_2 FError^{May1}_{i,t+1} + \varepsilon_{i,t+1} \tag{3}$$

where $FError^{May1}$ is the price scaled forecast error for that firm's year t+1 earnings based on the last individual forecast issued prior to May 1 of year t+1. I utilize the cut-off date of May 1 because it is the beginning of the return period and is therefore the appropriate time to use in testing whether inefficient market expectations of earnings are reflected in inefficient analyst forecasts. For firm-years with multiple forecasts issued on that same last day, I create a consensus forecast based on the median of all forecasts from that day.

Comparing the estimate of β_1 from (3) to that obtained from (2) provides a measure of the degree to which analysts' errors explain the relation between BTDs and future returns. If analysts' errors are representative of similar BTD-related errors made by investors, then β_1 will approach zero after controlling for analysts' forecast errors. Conversely, if β_1 remains significantly positive, this would suggest that either BTD-related errors in investors' expectations are different from those of analysts, or that the anomalous pricing is not the result of errors in investors' expectations of t+1 earnings.

In addition to estimating the basic models above, I repeat the analysis using two analogous models that include various additional controls for abnormal returns:

$$\begin{aligned} SAR_{i,t+1} = {} & \alpha + \beta_1 rTAX_{i,t} + \beta_2 SIZE^{dec}_{i,t} + \beta_3 MB^{dec}_{i,t} + \beta_4 EP^{dec}_{i,t} + \beta_5 BETA^{dec}_{i,t} + \beta_6 SAR^{dec}_{i,t} \\ & + \beta_7 ACC^{dec}_{i,t} + \varepsilon_{i,t+1} \end{aligned} \tag{4}$$

$$\begin{aligned} SAR_{i,t+1} = {} & \alpha + \beta_1 rTAX_{i,t} + \beta_2 SIZE^{dec}_{i,t} + \beta_3 MB^{dec}_{i,t} + \beta_4 EP^{dec}_{i,t} + \beta_5 BETA^{dec}_{i,t} + \beta_6 SAR^{dec}_{i,t} \\ & + \beta_7 ACC^{dec}_{i,t} + \beta_8 FError^{May1}_{i,t+1} + \varepsilon_{i,t+1} \end{aligned} \tag{5}$$

where $EP_{i,t}$ is the ratio of earnings before extraordinary items to market value of common equity (Basu [1977]), $BETA_{i,t}$ is a measure of systematic risk estimated using monthly stock returns and the CRSP value-weighted index returns (including distributions) during the five years that end in April of year t+1 (Fama and French [1992]), $SAR_{i,t}$ is the size-adjusted return from the previous year to control for return momentum (Jegadeesh and Titman [1993]), and all other variables are as previously defined. Similar to TAX, the additional control variables are each converted to decile rankings, by year, and scaled to range from zero to one. This transformation allows the estimated coefficients to be interpreted as the return on a zero investment portfolio with a long position in firm-years in the highest decile and a short position in those in the lowest decile (Bernard and Thomas [1990]).

As noted above, Lev and Nissim's [2004] pricing investigation is complicated by the market bubble of the late-1990s. I follow them in removing base year 1998 (where the subsequent return period ranges from May 1 of 1999 to April 30 of 2000) from my tests as this represents the height of the bubble. The data requirements for estimating (2) – (5) result in a usable sample of 11,527 observations.

Results from estimating (2) – (5) are presented in Table 4. Reported coefficient estimates and *t*-statistics are calculated based on the time series distributions of the coefficients from the annual regressions (Fama and MacBeth [1973]).[15] The annual coefficients are weighted by the square root of their sample size when calculating the average coefficients (e.g., Bradshaw et al. [2006]). Consistent with Lev and Nissim [2004], the first row of Panel A indicates that firms with higher TAX ratios have subsequent annual returns that are higher than those with lower

[15] The Fama-MacBeth approach assumes independence through time. Abarbanell and Bernard [2000] propose an adjustment factor for Fama-MacBeth standard errors in the presence of first-order serial correlation. However, serial correlation should not be an issue with excess returns regressions (e.g., Bradshaw et al. [2006], Schmidt [2006]). Accordingly, the *t*-statistics reported in Table 4 are based on unadjusted standard errors. As expected, inferences are unaffected if the Abarbanell and Bernard adjustment is applied.

TAX ratios. The second row of Panel A presents the results of estimating model (3), after introducing a control for analysts' forecasts errors. The coefficient on rTAX becomes small and insignificantly different from zero after controlling for analysts' forecast errors, suggesting that inefficiencies in analysts' expectations with respect to information contained in BTD represent similar inefficiencies in the market's earnings expectations. The time series of differences between β_1 as estimated in (2) and (3) can be used to test the statistical significance of the change in β_1 from before to after the inclusion of analysts' forecast errors in the model (Shane and Brous [2001]). A *t*-test on the series of differences confirms that the mean change is significantly different from zero (*t*-statistic of 5.05). The results of estimating (4) and (5), reported in Panel B, confirm that the above results are robust to the inclusion of the various control variables as the rTAX coefficient again becomes small and statistically indistinguishable from zero after adding forecast errors to the model. In sum, the results from Table 4 suggest that analysts' forecast errors reflect similar errors made by investors, providing additional support for the misvaluation explanation.

INSERT TABLE 4 ABOUT HERE

VI. ADDITIONAL ANALYSES

Estimates of Net Tax Income

In this section I examine the sensitivity of the results to the largest potential sources of error in estimating net tax income (see appendix for additional discussion). First, I consider the issue of employee stock options. While tax deductions are granted under tax rules at the time options are exercised, under the GAAP applicable during my study period the tax benefit from option exercises is credited directly to stockholders' equity rather than the income tax expense account.[16] Therefore, to the extent that stock option deductions are present for a certain firm, using that firm's reported income tax expense to approximate their tax liability will result in errors. To address this issue I construct an indicator variable set equal to one for firms in industries with high propensities to use stock options (SIC codes 30-39 and 70-89; Aboody [1996], Huson et al. [2001]) and zero otherwise. I then modify model (1) to include this variable and an interaction between this variable and rTAX. Untabled results for both month 1 and month 5 suggest that errors in the estimate of tax income stemming from stock options are not driving the primary results, as forecast errors continue to be positively related to rTAX and the interaction term is insignificant in both cases.

Second, I consider the issue of tax rates. U.S. multinational corporations are likely to face differing tax rates across the various jurisdictions in which they operate. These varying rates can potentially induce error in my estimate of net tax income. To mitigate concerns about this effect influencing the primary results, I perform the following additional analysis. First, I calculate the ratio of the absolute value of pre-tax foreign income to the sum of the absolute values of pre-tax foreign and domestic income. I then create a dummy variable set equal to one for any observations for which this ratio is greater than 20% and zero otherwise.[17] Untabled results confirm that analysts' forecast errors continue to be positively related to rTAX for both forecasting horizons after including this dummy variable and its interaction with rTAX. This interaction term is also insignificant in both months and thus I conclude that tax rate considerations are unlikely to have a significant impact on the primary results.

[16] Hanlon and Shevlin [2002] provide a detailed discussion of financial reporting issues associated with employee stock options.
[17] Results are qualitatively similar if the dummy variable is set equal to one for all firm-years which have non-zero amounts of foreign-source income.

Finally, I consider the issues of net operating loss deductions and tax credits. To examine the possible effects of net operating losses, I first construct a dummy variable equal to one for all observations with negative current tax expense or for which Compustat records a positive amount of unused net operating loss carryforward (Compustat #52) (Mills et al. [2003]). To address the issue of tax credits I create a dummy variable that is set equal to one for all firm-years for which the ratio of investment tax credit (#51) to sales (#12) is in the highest quintile.[18] In all cases, forecast errors remain positively associated with rTAX after the inclusion of the additional dummy variables and interactions, and all interaction terms are statistically indistinguishable from zero.

Measures of book-tax differences and components

In this section I consider additional measures of BTDs. The measure of BTDs employed in the primary analysis is based on the ranked ratio of net tax income to net book income. One advantage of this measure, as opposed to one based on the simple difference between net tax income and net book income, stems from the fact that current tax expense for firms with tax losses is truncated at zero (or the amount of taxable income from prior years available to obtain a refund through a loss carryback). Thus the true amount of taxable income including losses is potentially measured with error. Using the TAX ratio, the effects of this error are mitigated as these firm-years are appropriately assigned the lowest rTAX rank, which is not necessarily the case when using a measure based on the difference. However, use of this ratio may potentially lead to some undesirable consequences (e.g., small denominator problems). For this reason, I

[18] While Compustat's data item #51 is labeled "investment tax credit," it also includes other general business credits such as research and development credits. However, the reliability of this variable in reflecting these items is unclear, because financial statement disclosure of these items is not standardized. Similar results are obtained by instead basing the dummy variable on the ratio of research and development expense (#46) to sales. Results are also robust to adjusting the estimate of net tax income directly for any reported investment tax credit (see appendix for details).

test the sensitivity of the results to an alternative definition of total BTDs based on the difference between net tax income and net book income. Specifically, I substitute $rTAX^{DIFF}$ for rTAX, where TAX^{DIFF} is defined as estimated net tax income minus net book income, scaled by average total assets. Results are reported in the first two columns of Table 5. Forecast errors remain positively associated with BTDs using this alternative measure, suggesting that the choice of using the ratio of net tax income to net book income as the primary measure of BTDs is not driving the main results.[19]

INSERT TABLE 5 ABOUT HERE

As discussed above, one advantage of using a comprehensive measure of BTDs is that separating total BTDs into their components using financial statement data can be problematic empirically, potentially reducing the ability of the individual components to signal earnings quality. However, some recent research (e.g., Phillips et al. [2003], Hanlon [2005]) attempts to isolate the temporary differences component of total BTDs using deferred tax expense. As a link to this literature, I also test the relation between forecast errors and BTDs after decomposing TAX^{DIFF} into estimates of the portions attributable to temporary differences (TEMPBTD) and to other differences (permanent differences, tax accruals) (OTHERBTD).

To estimate temporary differences, I follow previous research by grossing up deferred tax expense at the U.S. statutory tax rate (τ) and then scaling by average total assets (e.g., Hanlon [2005]).[20] I take the negative of this amount so that positive values represent cases where temporary differences cause tax income to be higher relative to book income. To measure the

[19] Results are also robust to using TAX, as opposed to rTAX (i.e., using the unranked version of TAX).
[20] More precisely, deferred taxes are measured as the sum of deferred federal (Compustat #269) and foreign (#270) income tax expense, or, when either of these amounts is not available, as total deferred tax expense (#50).

contribution of temporary differences to the total difference between net tax income and net book income, I form TEMPBTD by multiplying the estimated temporary differences by $(1 - \tau)$ (see appendix). OTHERBTD is then calculated as the difference between TAX^{DIFF} and TEMPBTD.

The third and fourth columns of Table 5 present results after substituting rTEMPBTD and rOTHERBTD for $rTAX^{DIFF}$. The estimated coefficients on both BTD components are positive and significant in both months, indicating that each type is associated with analysts' future forecast errors. F-tests (untabled) indicate that the estimated coefficients on rTEMPBTD and rOTHERBTD are statistically indistinguishable from each other (p=0.61 for month 1 and p=0.54 for month 5). In sum, the results from Table 5 demonstrate that the relation between BTDs and forecast errors holds for both an alternative measure of total BTDs and its components, and further that neither component dominates the other.

Changes in GAAP for Income Taxes

The current GAAP standard governing the accounting for income taxes, SFAS No. 109, became effective for fiscal years beginning after December 15, 1992, and therefore my sample includes observations from time periods corresponding to before and after this change. Since the advent of SFAS No. 109 had the potential of changing the information environment related to income taxes disclosures, I examine whether the relation between BTD and forecast errors holds for both of the time periods.[21]

Table 6 reports the results of estimating the forecast error model augmented with an indicator variable for the pre-SFAS 109 era (PRE109) and its interactions with each of the independent variables. Both rTAX and its interaction with PRE109 are significantly positive for both forecasting horizons, leading to two noteworthy conclusions. First, the general pattern of

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[21] A more detailed discussion of the major provisions that changed with the advent of SFAS No. 109 can be found in Ayers [1998].

greater optimistic bias for firms with relatively low net tax income exists in both periods. Second, the magnitude of this bias is greater in the pre-109 period than in the post-109 period. This result, combined with the earlier result that analysts' forecast errors appear to proxy for similar errors on behalf of investors, is consistent with Lev and Nissim [2004], who report larger BTD-related predictable returns in the pre-109 era. While the decline in the relation between BTDs and forecast errors is consistent with SFAS 109 representing an improvement in the accounting for income taxes, the relations between forecast errors and other predictors (SIZE and MB) are also larger in the pre-109 time period, suggesting that this result is attributable to a more general increase in the accuracy of analysts' forecasts over time (e.g., Brown [2001]).

INSERT TABLE 6 ABOUT HERE

VII. CONCLUSION

This paper investigates whether financial analysts and investors use the information in book-tax differences efficiently in forming their expectations of future earnings. This work is motivated primarily by results from prior research that indicate that BTDs contain information useful for predicting future earnings realizations, but that BTDs also predict future stock returns, leading to the conjecture that market participants fail to efficiently impound this information into their expectations (Lev and Nissim [2004]). This conclusion, however, faces the challenge of whether the predictable future returns are evidence of mispricing, as alleged, or are simply the result of omitted risk factors or other unknown research design flaws. This study attempts to overcome these issues by utilizing the published earnings expectations of financial analysts, and linking them to the expectations of investors, as implied by prices.

Results indicate that analysts' earnings forecasts tend to be relatively more optimistic for firms whose net tax income in the prior year was low compared to the corresponding amount of financial reporting income. While firms with relatively low net tax income compared to net book income tend to have lower earnings in the future, analysts appear to largely overlook this signal, leading to systematic errors in their earnings forecasts. I conclude from this evidence that analysts' forecasts fail to efficiently impound the earnings quality information in BTDs.

The second phase of this study links the inefficiencies in analysts' forecasts more directly with the pricing results from prior research to investigate the effects of BTDs on investors' expectations. Future return regressions indicate that systematic BTD-related errors in analysts' expectations largely explain the previously documented relation between BTDs and future returns, as this relation becomes insignificant once conditioned on analysts' forecast errors. These results suggest that the observable BTD-related errors in analysts' forecasts reflect similar systematic errors on behalf of investors and lend support to the notion that investors also fail to use BTD-related information efficiently in forming their expectations of future earnings, consistent with the misvaluation explanation.

APPENDIX

Conceptual and Empirical Formulation of the TAX Ratio

The primary variable of interest in this study, TAX, is based on the ratio of net tax income (NTI) to net book income (NBI) and is adopted from Lev and Nissim [2004]. Implementing this signal empirically is complicated by the fact that information on actual tax income is not publicly available and therefore must be estimated. The purpose of this appendix is to provide a framework for better understanding what is captured by TAX, both conceptually and empirically, and in the process shed light on potential sources of measurement error.[22]

By comparing after-tax measures of book and tax income, Lev and Nissim [2004] argue that the TAX ratio is a comprehensive measure that captures various types of BTDs (i.e., temporary differences, permanent differences, and tax accruals).[23] In examining this ratio more closely, it is useful to first consider differences in pre-tax measures of income:

$$PTBI = TI + TEMP + PERM + NOL \qquad (A1)$$

where PTBI represents pre-tax book income, TI represents taxable income, TEMP represents temporary differences, PERM represents permanent differences and NOL represents deductions from the use of net operating loss carryforwards.[24] While much of the previous literature on BTDs focuses on differences in pre-tax measures of income, it is also interesting to consider tax

[22] In the interest of reducing unnecessary complexity, the analyses that follow assume that the statutory tax rate is constant across foreign jurisdictions. However, the general framework presented here can be expanded to accommodate varying foreign tax rates. Section VI presents empirical sensitivity analyses related to varying foreign tax rates.

[23] Temporary and permanent differences both represent differences in *pre-tax* measures of book and tax income. Temporary differences are primarily composed of differences in the timing of recognition of certain revenue and expense items, while permanent differences represent scope differences between book and tax accounting in their respective definitions of revenues and expenses. Tax accruals represent adjustments that affect book income tax expense but not the actual tax due to the tax authorities (e.g., deferred tax valuation allowance, foreign earnings designated as permanently reinvested, tax "cushions"). Hence, tax accruals lead to differences in *after-tax* (i.e., net) measures of book and tax income. See Lev and Nissim [2004] for further discussion.

[24] NOL in (A1) can be thought of as also including statutory special deductions (i.e., dividends received deductions). However, these special deductions tend to be small. For example, the 2002 IRS Sourcebook of Statistics of Income reports that, in the aggregate that year, dividends received deductions were less than 3% of corporate income subject to tax. Accordingly, I focus on the more material deductions from net operating loss carryforwards.

accruals, which cause further differences in after-tax measures of book and tax income. Investors are likely to be concerned with after-tax measures of performance, and tax accruals represent financial reporting choices that require a significant degree of managerial judgment, are likely to involve substantial information asymmetry, and do not have tax consequences. We can expand (A1) to consider tax accruals by shifting the focus to after-tax measures of book and tax income as follows. First, NBI can be represented as

$$\begin{aligned} \text{NBI} &= \text{PTBI} - \text{Income Tax Expense} \\ &= \text{PTBI} - [(\text{PTBI} - \text{PERM} - \text{NOL})\tau - \text{TAXACC} - \text{CRED}] \end{aligned} \tag{A2}$$

where τ represents the statutory tax rate, TAXACC represents tax accruals and CRED represents tax credits. Substituting (A1) into (A2) and combining terms yields

$$\text{NBI} = (\text{TI} + \text{TEMP})(1 - \tau) + \text{PERM} + \text{TAXACC} + \text{CRED} + \text{NOL} \tag{A3}$$

Similarly, NTI can be represented as

$$\begin{aligned} \text{NTI} &= \text{TI} - \text{Tax Liability} \\ &= \text{TI} - [\text{TI}(\tau) - \text{CRED}] \end{aligned} \tag{A4}$$

In developing their ratio of estimated NTI to NBI, Lev and Nissim [2004] define TAX conceptually as

$$\text{TAX} = \frac{\text{TI}(1-\tau)}{(\text{TI}+\text{TEMP})(1-\tau)+\text{PERM}+\text{TAXACC}} \tag{A5}$$

Comparing (A5) to (A3) and (A4) makes it clear that for the numerator and denominator of TAX to represent NTI and NBI, respectively, requires the implicit assumption that tax credits and deductions from net operating loss carryforwards are zero. Therefore the interpretation of the ratio of NTI to NBI as a measure that captures TEMP, PERM and TAXACC can be complicated somewhat by the presence of these additional factors. More generally, from (A3) and (A4)

$$\frac{\text{NTI}}{\text{NBI}} = \frac{\text{TI}(1-\tau) + \text{CRED}}{(\text{TI}+\text{TEMP})(1-\tau) + \text{PERM} + \text{TAXACC} + \text{CRED} + \text{NOL}} \tag{A6}$$

Accordingly, Section VI discusses sensitivity analyses related to tax credits and net operating loss deductions.

Implementing the TAX ratio empirically requires the estimation of TI, which is commonly achieved by grossing up current tax expense (CTE) by the statutory rate (i.e., $\hat{\text{TI}} = \frac{\text{CTE}}{\tau}$). This estimate of TI is then used to estimate NTI as

$$\hat{\text{NTI}} = \hat{\text{TI}}(1-\tau) = \frac{\text{CTE}}{\tau}(1-\tau) \tag{A7}$$

While it is recognized that this estimate can lead to measurement error, my objective here is to make the form of potential errors more explicit in order to better understand their possible implications for the empirical use of the TAX ratio.

Current tax expense for financial reporting purposes can be represented as

$$\text{CTE} = (\text{TI} + \text{OPT})\tau - \text{CRED} + \Delta\text{CUSH} \tag{A8}$$

where OPT represents tax deductions from the exercise of employee stock options (under the financial reporting rules effective during my sample period this deduction does not reduce CTE and thus must be added back to TI) and ΔCUSH represents any effects on CTE from changes in accrued liabilities for uncertain tax positions. Substituting (A8) into (A7) and comparing the result with (A4) yields the following expression for the measurement error in estimating NTI:

$$\hat{\text{NTI}} - \text{NTI} = \text{OPT}(1-\tau) - \frac{\text{CRED}}{\tau} + \Delta\text{CUSH}\frac{(1-\tau)}{\tau} \tag{A9}$$

Sensitivity analyses related to stock option deductions and tax credits are discussed in Section VI. Unfortunately, there is no reliable way to empirically measure the effect of tax cushions since firms typically do not disclose this amount (Gleason and Mills [2002]). However, tax cushions are a type of tax accrual—and thus a component of total BTDs—that the TAX ratio is intended to capture. To the extent that book-income-increasing (-decreasing) changes in tax cushions that affect CTE exist, they will lead to lower (higher) estimates of the TAX ratio and thus will potentially increase the ability of TAX to capture this type of BTD.

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TABLE 1

Descriptive Statistics (N=12,898 firm-years)

Panel A: This panel provides information on variable distributions.

Variable	Mean	Standard Deviation	1st Quartile	Median	3rd Quartile
$\mathbf{FError^{M1}}$	-0.014	0.037	-0.020	-0.003	0.003
$\mathbf{FError^{M5}}$	-0.009	0.026	-0.012	-0.002	0.002
TAX	0.917	0.876	0.551	0.859	1.075
SIZE	6.871	1.632	5.689	6.770	7.946
MB	3.273	2.956	1.617	2.395	3.758
ΔFOL	0.080	0.331	-0.125	0.000	0.200
PYFE	-0.003	0.017	-0.007	0.000	0.003
ACC	-0.032	0.076	-0.076	-0.040	0.004

Panel B: This panel provides information on correlations between variables (Pearson correlations above the diagonal and Spearman correlations below). p-values are provided in parentheses.

	$\mathbf{FError^{M1}}$	$\mathbf{FError^{M5}}$	**rTAX**	**SIZE**	**MB**	**ΔFOL**	**PYFE**	**ACC**
$\mathbf{FError^{M1}}$		0.8709	0.0738	0.2222	0.1458	0.1064	0.2565	-0.1228
		(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
$\mathbf{FError^{M5}}$	0.8340		0.0720	0.1961	0.1342	0.0805	0.2236	-0.0948
	(0.0001)		(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
rTAX	0.0425	0.0532		0.0479	0.0385	-0.0240	0.0019	0.0923
	(0.0001)	(0.0001)		(0.0001)	(0.0001)	(0.0007)	(0.8321)	(0.0001)
SIZE	0.1758	0.1437	0.0475		0.3460	-0.0875	0.1498	-0.1532
	(0.0001)	(0.0001)	(0.0001)		(0.0001)	(0.0001)	(0.0001)	(0.0001)
MB	0.1893	0.1635	0.0732	0.3624		0.1408	0.1463	0.0307
	(0.0001)	(0.0001)	(0.0001)	(0.0001)		(0.0001)	(0.0001)	(0.0005)
ΔFOL	0.1043	0.0827	-0.0171	-0.0237	0.1922		0.1268	0.0593
	(0.0001)	(0.0001)	(0.0525)	(0.0071)	(0.0001)		(0.0001)	(0.0001)
PYFE	0.2813	0.2261	0.0087	0.1370	0.2769	0.1879		-0.0192
	(0.0001)	(0.0001)	(0.3251)	(0.0001)	(0.0001)	(0.0001)		(0.0289)
ACC	-0.1144	-0.0929	0.0898	-0.1469	0.0804	0.0591	-0.0286	
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0012)	

Variable definitions: $FError^{M1}$ is actual t+1 earnings minus the median individual forecast made during month 1, scaled by month 1 stock price. $FError^{M5}$ is defined similarly, but is based on the median individual forecast made during month 5. TAX is the ratio of estimated tax net income to book net income for year t. rTAX is the decile ranking of TAX, scaled to range from [0,1]. SIZE is the natural log of market capitalization at the end of year t. MB is the ratio of market capitalization to book value of common equity at the end of year t. ΔFOL is the change in the number of unique analysts making earnings forecasts for firm i from year t to year t+1, divided by the number from year t. PYFE is price-scaled forecast error from the previous year, defined as the actual year t earnings minus the median individual forecast of those earnings from midyear (month 6) of year t. ACC is the ratio of accruals to net income for year t.

TABLE 2

Simple Regressions of Actual Changes in Earnings Per Share, Forecasted Changes in Earnings Per Share and Errors in Forecasts of Earnings Per Share (all at time t+1) on Book-Tax Differences from time t (N=12,898 firm years)

$$Y_{i,t+1} = \alpha + \beta rTAX_{i,t} + \varepsilon_{i,t+1}$$

	Dependent Variable ($Y_{i,t+1}$):				
	Actual Change in EPS	Forecasted Change in EPS		Forecast Error	
	ΔEPS	**FΔEPS^{M1}**	**FΔEPS^{M5}**	**FError^{M1}**	**FError^{M5}**
Intercept	-0.0065	0.0114	0.0050	-0.0179	-0.0115
	(-5.57)	(12.36)	(5.06)	(-25.25)	(-22.55)
rTAX	0.0069	-0.0016	0.0010	0.0085	0.0059
	(3.93)	(-1.16)	(0.65)	(7.44)	(7.18)

Variable definitions and notes: ΔEPS is the change in earnings per share from year t to year t+1. FΔEPS^{M1} is the consensus forecasted change in earnings per share from year t to year t+1, based on the median individual forecast made during month 1 subsequent to the release of year t earnings. FΔEPS^{M5} is the consensus forecasted change in earnings per share from year to year t+1, where the consensus is the median individual forecast made during month 5 subsequent to the release of year t earnings. FError^{M1} is actual t+1 earnings minus the median individual forecast made during month 1. FError^{M5} is actual t+1 earnings minus the median individual forecast made during month 5. rTAX is the decile ranking of the ratio of estimated net tax income to net book income for year t, scaled to range from [0,1]. All earnings per share amounts are as defined by I/B/E/S, and the dependent variable in each model is scaled by stock price from the first month subsequent to the release of year t earnings. White *t*-statistics are provided in parentheses.

TABLE 3

Regressions of Forecast Errors on Book-Tax Differences and Control Variables (N=12,898 firm-years)

$$\text{FError}_{i,t+1} = \alpha + \beta_1 \text{rTAX}_{i,t} + \beta_2 \text{SIZE}_{i,t} + \beta_3 \text{MB}_{i,t} + \beta_4 \Delta\text{FOL}_{i,t+1} + \beta_5 \text{PYFE}_{i,t} + \beta_6 \text{ACC}_{i,t} + \sum_t \beta_{7,t} \text{YEAR}_t + \varepsilon_{i,t+1}$$

	Dependent Variable:	
	FError^{M1}	**FError^{M5}**
	Est. Coefficient (*t*-statistic)	**Est. Coefficient (*t*-statistic)**
Intercept	-0.0570 (-20.76)	-0.0370 (-17.90)
rTAX	0.0086 (8.16)	0.0059 (7.56)
SIZE	0.0037 (17.58)	0.0022 (14.09)
MB	0.0006 (7.41)	0.0004 (6.63)
ΔFOL	0.0101 (10.65)	0.0051 (7.63)
PYFE	0.4428 (13.30)	0.2760 (11.01)
ACC	-0.0495 (-10.38)	-0.0268 (-7.67)
Adj. R-sq.	0.149	0.109

Notes and variable definitions: White *t*-statistics are provided in parentheses. FError^{M1} is actual t+1 earnings minus the median individual forecast made during month 1, scaled by month 1 stock price. FError^{M5} is defined similarly, but is based on the median individual forecast made during month 5. rTAX is the decile ranking of the ratio of estimated net tax income to net book income for year t, scaled to range from [0,1]. SIZE is the natural log of market capitalization at the end of year t. MB is the ratio of market capitalization to book value of common equity at the end of year t. ΔFOL is the change in the number of unique analysts making earnings forecasts for firm i from year t to year t+1, divided by the number from year t. PYFE is price-scaled forecast error from the previous year, defined as the actual year t earnings minus the median individual forecast of those earnings from midyear (month 6) of year t. ACC is the ratio of accruals to net income for year t. YEAR dummy variables are also included in the regressions, but the corresponding coefficient estimates are omitted from the table.

TABLE 4

Time-Series Means and t-statistics for Coefficients from Annual Cross-Sectional Regressions of Future Size-Adjusted Returns on Book-Tax Differences Before and After Conditioning on Analysts' Forecast Errors (N=11,527 firm-years)

Panel A: Simple regressions, before and after conditioning on analysts' forecast errors

$$SAR_{i,t+1} = \alpha + \beta_1 rTAX_{i,t} + \varepsilon_{i,t+1}$$

$$SAR_{i,t+1} = \alpha + \beta_1 rTAX_{i,t} + \beta_2 FError^{May1}_{i,t+1} + \varepsilon_{i,t+1}$$

Intercept	rTAX	$FError^{May1}$	Adj. R^2
-0.011	0.032		0.001
(-0.91)	(2.44)		
0.051	0.002	3.883	0.110
(3.86)	(0.20)	(13.49)	

Panel B: Regressions with controls for additional risk factors and anomalies

$$SAR_{i,t+1} = \alpha + \beta_1 rTAX_{i,t} + \beta_2 SIZE^{dec}_{i,t} + \beta_3 MB^{dec}_{i,t} + \beta_4 EP^{dec}_{i,t} + \beta_5 BETA^{dec}_{i,t} + \beta_6 SAR^{dec}_{i,t} + \beta_7 ACC^{dec}_{i,t} + \varepsilon_{i,t+1}$$

$$SAR_{i,t+1} = \alpha + \beta_1 rTAX_{i,t} + \beta_2 SIZE^{dec}_{i,t} + \beta_3 MB^{dec}_{i,t} + \beta_4 EP^{dec}_{i,t} + \beta_5 BETA^{dec}_{i,t} + \beta_6 SAR^{dec}_{i,t} + \beta_7 ACC^{dec}_{i,t} + \beta_8 FError^{May1}_{i,t+1} + \varepsilon_{i,t+1}$$

Intercept	rTAX	$SIZE^{dec}$	MB^{dec}	EP^{dec}	$BETA^{dec}$	SAR^{dec}	ACC^{dec}	$FError^{May1}$	Adj. R^2
0.005	0.040	-0.019	-0.040	0.047	-0.042	0.068	-0.054		0.041
(0.15)	(3.05)	(-0.74)	(-1.30)	(3.24)	(-1.42)	(2.61)	(-3.94)		
0.161	0.012	-0.090	-0.083	0.045	-0.016	-0.042	-0.030	4.398	0.157
(4.14)	(1.10)	(-3.36)	(-2.50)	(2.74)	(-0.59)	(-1.56)	(-2.20)	(13.53)	

Notes and variable definitions: Coefficient estimates are mean coefficients from annual regressions weighting each annual coefficient by the square root of sample size for each year. The *t*-statistics (reported in parentheses below coefficient estimates) are based on the standard error of the coefficient estimates across the annual regressions. $SAR_{i,t+1}$ is the annual size-adjusted buy-hold return measured from May 1 of year t+1. rTAX is the decile ranking based on the ratio of estimated after-tax income to book income from year t. $FError^{May1}$ is year t+1 actual earnings minus the last forecast of those earnings issued prior to May 1, scaled by stock price. $SIZE^{dec}$ is the decile ranking based on the natural log of market capitalization at the end of year t. MB^{dec} is the decile ranking based on the ratio of market capitalization to book value of common equity at the end of year t. EP^{dec} is the decile ranking based on the ratio of earnings before extraordinary items to market value of common equity at fiscal year-end. $BETA^{dec}$ is the decile ranking based on a measure of systematic risk estimated using monthly stock returns and the CRSP value-weighted index returns (including distributions) during the five years that end in April year t+1. SAR^{dec} is the decile ranking based on the annual size-adjusted buy-hold return measured from May 1 of year t. ACC^{dec} is the decile ranking based on the ratio of accruals to net book income for year t. All decile rankings are scaled to range from [0,1].

TABLE 5

Regressions of Forecast Errors on Alternate Definitions of Book-Tax Differences and Control Variables
(N=12,898 firm-years)

$$\text{FError}_{i,t+1} = \alpha + \beta_1 \text{rTAX}^{\text{DIFF}}_{i,t} + \beta_2 \text{SIZE}_{i,t} + \beta_3 \text{MB}_{i,t} + \beta_4 \Delta\text{FOL}_{i,t+1} + \beta_5 \text{PYFE}_{i,t} + \beta_6 \text{ACC}_{i,t} + \sum_t \beta_{7,t} \text{YEAR}_t + \varepsilon_{i,t+1}$$

$$\text{FError}_{i,t+1} = \alpha + \beta_{1a} \text{rTEMPBTD}_{i,t} + \beta_{1b} \text{rOTHERBTD}_{i,t} + \beta_2 \text{SIZE}_{i,t} + \beta_3 \text{MB}_{i,t} + \beta_4 \Delta\text{FOL}_{i,t+1} + \beta_5 \text{PYFE}_{i,t} + \beta_6 \text{ACC}_{i,t} + \sum_t \beta_{7,t} \text{YEAR}_t + \varepsilon_{i,t+1}$$

	Dependent Variable:			
	FError^{M1}	**FError^{M5}**	**FError^{M1}**	**FError^{M5}**
Intercept	-0.0564	-0.0364	-0.0580	-0.0375
	(-20.66)	(17.76)	(-20.68)	(-17.90)
$\text{rTAX}^{\text{DIFF}}$	0.0066	0.0041		
	(6.95)	(6.00)		
rTEMPBTD			0.0050	0.0034
			(5.14)	(4.70)
rOTHERBTD			0.0044	0.0028
			(4.61)	(4.05)
SIZE	0.0037	0.0023	0.0038	0.0023
	(17.84)	(14.34)	(17.94)	(14.43)
MB	0.0007	0.0004	0.0007	0.0004
	(8.07)	(7.23)	(7.67)	(6.86)
ΔFOL	0.0100	0.0050	0.0099	0.0050
	(10.54)	(7.51)	(10.46)	(7.44)
PYFE	0.4480	0.2791	0.4463	0.2783
	(13.40)	(11.10)	(13.38)	(11.08)
ACC	-0.0479	-0.0256	-0.0477	-0.0256
	(-10.06)	(-7.32)	(-9.88)	(-7.21)
Adj. R-sq.	0.147	0.107	0.146	0.107

Notes and variable definitions: White *t*-statistics are provided in parentheses. FError^{M1} is actual t+1 earnings minus the median individual forecast made during month 1, scaled by month 1 stock price. FError^{M5} is defined similarly, but is based on the median individual forecast made during month 5. $\text{rTAX}^{\text{DIFF}}$ is the decile ranking of estimated net tax income minus net book income, divided by average total assets, scaled to range from [0,1]. TEMPBTD and OTHERBTD are the components of TAX^{DIFF}. TEMPBTD is measured as estimated temporary differences scaled by average total assets and multiplied by $(1 - \tau)$. OTHERBTD is TAX^{DIFF} minus TEMPBTD. rTEMPBTD and rOTHERBTD are the decile rankings of TEMPBTD and OTHERBTD, respectively, scaled to range from [0,1]. SIZE is the natural log of market capitalization at the end of year t. MB is the ratio of market capitalization to book value of common equity at the end of year t. ΔFOL is the change in the number of unique analysts making earnings forecasts for firm i from year t to year t+1, divided by the number from year t. PYFE is price-scaled forecast error from the previous year, defined as the actual year t earnings minus the median individual forecast of those earnings from midyear (month 6) of year t. ACC is the ratio of accruals to net income for year t. Coefficient estimates from the YEAR dummy variables are omitted from the table.

TABLE 6

Forecast Error Regressions Testing Sensitivity to the Time Periods Previous and Subsequent to SFAS 109
(N=12,898 firm-years)

$$\begin{aligned}\text{FError}_{i,t+1} = {} & \alpha + \beta_1 \text{rTAX}_{i,t} + \beta_2 \text{SIZE}_{i,t} + \beta_3 \text{MB}_{i,t} + \beta_4 \Delta\text{FOL}_{i,t+1} + \beta_5 \text{PYFE}_{i,t} + \beta_6 \text{ACC}_{i,t} \\ & + \beta_7 \text{PRE109}_t + \beta_8 (\text{rTAX}_{i,t} \times \text{PRE109}_t) + \beta_9 (\text{SIZE}_{i,t} \times \text{PRE109}_t) \\ & + \beta_{10} (\text{MB}_{i,t} \times \text{PRE109}_t) + \beta_{11} (\Delta\text{FOL}_{i,t+1} \times \text{PRE109}_t) + \beta_{12} (\text{PYFE}_{i,t} \times \text{PRE109}_t) \\ & + \beta_{13} (\text{ACC}_{i,t} \times \text{PRE109}_t) + \sum_t \beta_{14,t} \text{YEAR}_t + \varepsilon_{i,t+1}\end{aligned}$$

	Dependent Variable:			
	FError^{M1}		**FError^{M5}**	
	Est. Coefficient	***t*-statistic**	**Est. Coefficient**	***t*-statistic**
Intercept	-0.0486	(-13.68)	-0.0297	(-11.29)
rTAX	0.0068	(5.43)	0.0044	(5.12)
SIZE	0.0034	(13.65)	0.0018	(9.94)
MB	0.0004	(4.56)	0.0003	(4.56)
ΔFOL	0.0118	(10.51)	0.0061	(8.10)
PYFE	0.4751	(9.58)	0.2400	(7.30)
ACC	-0.0471	(-8.48)	-0.0237	(-6.15)
PRE109	-0.0146	(3.72)	-0.0145	(-4.85)
rTAX × PRE109	0.0049	(2.18)	0.0040	(2.33)
SIZE × PRE109	0.0006	(1.28)	0.0011	(3.17)
MB × PRE109	0.0014	(5.53)	0.0010	(5.31)
ΔFOL × PRE109	-0.0055	(-2.63)	-0.0032	(-2.10)
PYFE × PRE109	-0.0665	(0.99)	0.0503	(1.04)
ACC × PRE109	-0.0074	(-0.71)	-0.0093	(-1.19)
Adj. R-sq.	0.152		0.114	

Notes and variable definitions: White *t*-statistics are provided in parentheses. FError^{M1} is actual t+1 earnings minus the median individual forecast made during month 1, scaled by month 1 stock price. FError^{M5} is defined similarly, but is based on the median individual forecast made during month 5. rTAX is the decile ranking of the ratio of estimated net tax income to net book income for year t, scaled to range from [0,1]. SIZE is the natural log of market capitalization at the end of year t. MB is the ratio of market capitalization to book value of common equity at the end of year t. ΔFOL is the change in the number of unique analysts making earnings forecasts for firm i from year t to year t+1, divided by the number from year t. PYFE is price-scaled forecast error from the previous year, defined as the actual year t earnings minus the median individual forecast of those earnings from midyear (month 6) of year t. ACC is the ratio of accruals to net income for year t. PRE109 is an indicator variable set equal to 1 for firm-years beginning prior to December 15, 1992, and zero otherwise. Coefficient estimates from the YEAR dummy variables are omitted from the table.