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Dissertation

**DETERMINANTS AND CONSEQUENCES OF
INTRA-YEAR ERROR IN
ANNUAL EFFECTIVE TAX RATE ESTIMATES**

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ABSTRACT

This paper investigates the determinants of intra-year error in annual effective tax rate estimates, relative to the actual annual effective tax rate (“ETR Miss”) and examines whether ETR Miss contains value relevant information. I find that ETR Miss is affected by both unbiased estimation errors related to the predictability of business fundamentals and biased estimation related to varying managerial incentives within the year. Firms with higher ETR Miss exhibit less persistent pre-tax earnings and earnings components, consistent with ETR Miss containing information on earnings quality. Finally, for firms with higher ETR Miss, investors place a lower weight on accounting earnings, consistent with the market incorporating information in ETR Miss for valuation assessments.

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1. Introduction

One of the most important accounting estimates in the preparation of financial reports is the estimate of income tax expense. According to U.S. GAAP, companies need to estimate annual effective tax rate (ETR) when determining income tax expense in the interim statements.¹ Firms are thus required to make four estimates of the same underlying annual ETR during the year.² Assuming no behavior bias, if companies make good faith estimates, we would expect that over time average interim estimates of annual ETR should converge to year-end annual ETR. However, prior studies document a persistent pattern of intra-year error in annual ETR estimates, manifested by an average overestimation of annual ETR in interim periods. This study examines factors that account for the discrepancy between expected and observed annual ETR estimates. In addition, this study investigates whether investors appear to incorporate information related to ETR estimation into pricing.

To explore why interim estimates of annual ETR do not converge to year-end annual ETR, I study the intra-year error in annual ETR estimates, relative to the actual annual ETR (“ETR Miss”). Though prior literature has not studied ETR Miss directly, several studies have examined intra-year changes in annual ETR estimates, and have findings that form the basis of my study. In particular, prior studies show that the average effect of overestimation of annual ETR in the early quarters is associated with earnings

¹ Estimated annual effective tax rate equals expected annual income tax expense (net of tax credits) divided by expected annual pre-tax earnings; firms are required to estimate annual pre-tax earnings and annual income tax expense on each interim date.

² Annual ETR estimated at the year-end is the actual annual ETR reported by the firm.

management incentives later in the year (Comprix et al. 2012; Cook et al. 2008; Dhaliwal et al. 2004).

However, it is still unclear why firms are willing to, and able to, maintain the intra-year error in annual ETR estimates year after year, despite the requirement of the accounting rule that firms should make the best estimates of annual ETR on each interim date, and the fact that regulators and investors can evaluate how well firms comply with this accounting standard by observing the realized intra-year error in annual ETR estimates ex post.

Also, while prior literature shows the average effect of overestimation of annual ETR in the interim reports (Comprix et al. 2012), which is consistent with income-increasing incentives later in the year, it is possible for firms to have other incentives that may result in underestimation of annual ETR in the interim reports;³ it is also possible for firms to not engage in earnings management with intra-year changes in annual ETR estimates, resulting in no systematic over- or under-estimation of annual ETR in the interim reports.

To fully explore all these possibilities, I develop the construct of *ETR Miss* to represent the **non-directional** intra-year error in annual ETR estimates, relative to the actual annual ETR. I study the determinants of ETR Miss to examine whether ETR Miss is affected by both unbiased estimation errors related to the predictability of business fundamentals and biased estimation related to varying managerial incentives within the year.

³ For example, when firms want to defer disclosing information about uncertain tax positions as much as possible.

ETR estimation in interim reports also provides a unique setting to study the implications of accounting estimates on earnings quality and the value relevance of accounting information. This setting is unique for two reasons. First, the estimation error related to interim estimates of annual ETR can be assessed precisely by financial statement users ex post. Second, the estimate of annual ETR in interim reports is an estimate all firms need to make. Utilizing this unique setting, I use ETR Miss as a proxy for the quality of accounting estimates, and examine whether ETR Miss is related to earnings quality and the value relevance of accounting information.

I start by investigating the determinants of ETR Miss. I hypothesize that there are two broad reasons for ETR Miss: (i) the predictability of real economic activities and (ii) earnings management. For predictability, I examine whether ETR Miss is affected by factors that could result in deviations of ETR from the statutory rate: (i) the volatility of permanent differences;⁴ (ii) the existence of tax loss carryforward; (iii) the availability of R&D tax credits; and (iv) the scale of foreign operation. For earnings management, I examine whether ETR Miss is affected by (i) managers' flexibility with earnings management to meet varying incentives within the year; (ii) firms' general attitudes towards compliance with regulation; and (iii) the effectiveness of internal and external monitoring mechanisms in place.

I then examine the consequence of ETR Miss on earnings persistence by testing whether the persistence of pre-tax earnings and earnings components (i.e., the accrual and

⁴ My proxy for permanent differences is a broad proxy that not only includes pure permanent differences per se, but also includes the effects of tax credits and foreign-sourced earnings for ETR to deviate from the statutory rate. See Section 5.1 Research Design for Determinants of ETR Miss for detailed discussion on the proxy for permanent differences.

cash flow components of pre-tax earnings) change with the level of ETR Miss. Earnings persistence is the chosen attribute of earnings quality in my study because like ETR Miss, earnings persistence is determined internally by both business fundamentals and managerial discretion. Further, I investigate the consequence of ETR Miss on the value relevance of accounting information by testing whether the weight investors place on accounting earnings change with the level of ETR Miss.

Consistent with my hypothesis that ETR Miss is affected by factors from both the predictability dimension and the earnings management dimension, I find ETR Miss is increasing in the volatility of permanent differences, the existence of tax loss carryforward, the availability of R&D tax credit, the scale of foreign operations, firms' tax aggressiveness, the existence of internal control weakness, and the existence of earnings restatement, and ETR Miss is decreasing in the strength of corporate governance.⁵

Consistent with information in ETR Miss about the quality of accounting estimates indicating the quality of accounting earnings, I find that firms with higher ETR Miss (indicating lower quality accounting estimates) exhibit less persistent pre-tax earnings and earnings components (indicating lower quality accounting earnings). I also find that

⁵ Further analysis of effect size suggests that the scale of foreign operations is the single most important contributor to the explained variance of ETR Miss, where the proportion of the total variance of ETR Miss attributed to the effect of the scale of foreign operations is 2%. The proportion of the total variance attributed to the other six earnings management proxies combined (i.e., tax aggressiveness, financial reporting aggressiveness, the strength of corporate governance, auditor provided tax services, internal control weakness, and earnings restatement) is 1%; while the proportion of the total variance attributed to the other three predictability proxies combined (i.e., the volatility of permanent difference, tax loss carryforward, and R&D tax credit) is 0.3%. For comparison, the proportion of the total variance explained by the model is 6%.

for firms with higher ETR Miss, investors place a lower weight on accounting earnings, consistent with ETR Miss containing information relevant for market valuation.

My study makes three contributions. First, my study examines the intra-year error in annual ETR estimates, a property of the ETR that is missing from prior literature. I specifically construct a broad measure of permanent differences to proxy for factors that result in deviations of the ETR from the statutory tax rate (i.e., earnings taxed at non-statutory tax rate due to permanent differences, tax credits, and foreign-sourced earnings). My results show that ETR Miss is positively associated with the volatility of permanent differences.

Second, building on and adding to the literature on earnings management through tax accounts, I find ETR Miss is affected by both unbiased estimation errors related to the predictability of business fundamentals and biased estimation related to varying managerial incentives within the year.

Third, my study contributes to the literature on the impact of accounting estimates on earnings quality and value relevance. In particular, my results show ETR Miss, as a proxy for the quality of accounting estimates, indicates the quality of accounting earnings (earnings persistence in particular), and the market incorporates the information in ETR Miss into its valuation of accounting information.

Section 2 provides institutional background of annual ETR estimation on interim dates, as required by the integral method under GAAP. Section 3 reviews prior research and proposes a thorough study of ETR Miss to represent the non-directional intra-year error in annual ETR estimates, relative to the actual annual ETR. I develop specific

hypotheses regarding the determinants and consequences of ETR Miss after explaining its economic meaning. Section 4 provides the operationalization of ETR Miss by defining the *ETRMiss* metric, and describes the sample. Section 5 presents the research design, descriptive statistics, and empirical results regarding the determinants of ETR Miss. Section 6 presents results regarding the consequence of ETR Miss on earnings persistence. Section 7 presents results regarding the consequence of ETR Miss on the value relevance of accounting information. Section 8 discusses results for supplemental analyses using quarterly data. Section 9 presents results for robustness check. Section 10 concludes the paper.

2. GAAP Relating to Annual ETR Estimation on Interim Dates

U.S. GAAP requires the adoption of the integral method for determining expenses (e.g., income tax expenses) in interim reporting (i.e., financial reporting for periods shorter than one year). The integral method requires that firms estimate expense for the entire year, and then allocate the annual expense to the current period on a pro rata basis.

In the case of income tax expense, ASC 740 - *Income Taxes*,⁶ requires that on each interim date, firms make their best estimates of the ETR expected to be applicable for the entire fiscal year, after consideration of anticipated annual tax credits, foreign tax rates, and other tax planning alternatives. Firms should then apply the estimated annual ETR to their year-to-date ordinary pre-tax income to determine the year-to-date (YTD) income tax expense. The current period (i.e., the 3-month current quarter) income tax expense is

⁶ ASC 740 codifies accounting rules previously stated in APB Opinion No. 28 and its interpretation, FIN No. 18 regarding the integral method for interim tax reporting.

calculated by subtracting prior period YTD income tax expense from the current period YTD income tax expense. In other words, an annual effective tax *rate* is estimated on each interim date, and current period income tax *expense* is backed out using this estimated annual effective tax rate.

The above general rule applies to ordinary pre-tax income (i.e., income from continuing operations excluding unusual or infrequent items), while income tax expense related to unusual or infrequent items need to be reported using the discrete method as an exception to the general rule (i.e., income tax estimates for significant unusual or infrequent items are based on current period results only, independent of the annual ETR estimate).^{7, 8}

In sum, under GAAP, firms need to perform the following procedures for making income tax provisions in interim reports: (i) estimate the annual ETR for the entire year, given information available on the interim dates about the entire year's economic outcomes and tax planning strategies; (ii) apply the estimated annual ETR to YTD pre-tax ordinary income to determine YTD income tax expense for ordinary income; (iii) subtract prior period YTD income tax expense for ordinary income from current period YTD income tax expense to get current period income tax expense for ordinary income; (iv) estimate income tax expense associated with infrequent or unusual items from

⁷ Similarly, income tax expenses associated with items reported net of tax effects (e.g., discontinued operations or extraordinary items) are also estimated using the discrete method, though their associated tax expenses are not part of the reported income tax expense (i.e., these items do not affect the ETR estimation), and thus should not affect my analysis of intra-year error in annual ETR estimates.

⁸ To account for this exception, I exclude firm-years with special items in robustness check; as shown in robustness check, inferences remain the same after the exclusion.

continuing operations for the current period; (v) add the result from (iv) to the result from (iii) to get total income tax expense for the current period.

3. Prior Research and Hypothesis Development

3.1 Intra-Year Error in Annual ETR Estimates: The Construct of ETR Miss

3.1.1 Prior Research on Overestimation of Annual ETR in Interim Reports

Prior research shows an overestimation of annual ETR in interim reports. In particular, prior study documents that on average, annual ETR estimates start high in Q1, and then decrease monotonically in Q2, Q3, and Q4 (Comprix et al. 2012).

Explaining the average effect of overestimation of annual ETR in the early quarters, researchers have linked intra-year changes in annual ETR estimates with earnings management incentives. In particular, prior studies find that firms use intra-year changes in annual ETR estimates to meet earnings targets in annual and interim reports: firms manipulate annual ETR estimates to meet analyst earnings forecasts that they would otherwise have missed without the manipulation (Comprix et al. 2012; Cook et al. 2008; Dhaliwal et al. 2004).⁹

3.1.2 The Economic Meaning of the Construct of ETR Miss

Based on prior research that shows an average effect of overestimation of annual

⁹ These studies are consistent with the literature that shows managers have incentives to beat benchmarks (Dechow and Skinner 2000), where analyst forecast is a more important benchmark than losses or earnings decrease (Brown and Caylor 2005), and firms are rewarded by the market for beating analyst forecast (Bartov et al. 2002; Dopuch et al. 2007; Jiang 2008; Kasznik and McNichols 2002; Lopez and Rees 2002).

ETR in the interim periods, it is interesting to see why firms are willing to, and able to, maintain a persistent pattern of intra-year error in annual ETR estimates, as this observed pattern seems in violation of the accounting rule. I propose a thorough study of the intra-year error in annual ETR estimates, relative to the actual annual ETR, to better understand firm behaviors regarding accounting estimates, earnings quality, and the value relevance of accounting information. I term the construct of the intra-year error in annual ETR estimates “ETR Miss”, and use this term throughout the discussions below.

Representing the intra-year error in annual ETR estimates relative to the actual annual ETR, the construct of ETR Miss has two key dimensions: (i) the predictability of real economic activities that result in deviations of ETR from the statutory rate, which could affect the variability of *unbiased* ETR estimates within the year; and (ii) the intra-year variability of managerial incentives, which could result in manipulated ETR estimates, and thus the variability of the *biased* ETR estimates within the year.

The variability of the *observed* ETR estimates results from the interplay of forces from both dimensions. In my analysis, I start with the most basic case where both dimensions are fixed; and then proceed to analyze each dimension separately, holding the other dimension constant.

When both dimensions remain fixed within the year, i.e., if (i) managers are able to perfectly predict pre-tax earnings and income tax expenses for the entire year on all interim dates; and (ii) managers do not manipulate annual ETR estimates to meet varying incentives at different time of the year, assuming no behavioral bias, there should be

minimum variation in annual ETR estimates within the year (or equivalently, across the different interim dates), resulting in low ETR Miss.

When only the first dimension is allowed to change while the second dimension is fixed, (i.e., if managers make unbiased estimation), then ETR Miss solely depends on the predictability of real economic activities.¹⁰ When this is the case, higher predictability will lead to lower ETR Miss, and lower predictability will lead to higher ETR Miss.

When only the second dimension is allowed to change while the first dimension is fixed (i.e., if real economic activities are perfectly predictable within the year, but managers face varying incentives at different time of the year, and managers manipulate annual ETR estimates in response to the varying incentives), then ETR Miss depends on the variability of incentives and the actual manipulations through annual ETR estimates within the year. For example, firms could purposefully set a high annual ETR estimate at the beginning of the fiscal year, so that they could lower it when they need to boost after-tax earnings later in the year.^{11, 12} In the sense that higher variability allows managers more freedom to manipulate after-tax earnings to suit varying incentives at different time

¹⁰ Real economic activities resulting in earnings taxed at non-statutory rate directly affect ETR and ETR Miss, while real economic activities resulting in earnings taxed at the statutory rate indirectly affect ETR and ETR Miss, as ETR is the weighted average of the two types of earnings.

¹¹ This example is consistent with the empirical evidence in prior studies for (the average effect of the) overestimation of annual ETR in the interim periods, where the overestimation is instilled for income-increasing incentives (i.e., to meeting analyst forecasts) later in the year.

¹² Alternatively, firms could also purposefully set a low annual ETR estimate at the beginning of the year, to defer disclosing information about uncertain tax positions from the tax authority as much as possible.

of the year, higher manipulation will lead to higher ETR Miss, and lower manipulation will lead to lower ETR Miss.^{13, 14}

When both dimensions are allowed to change, ETR Miss depends on the dominant forces at play.

In sum, the intra-year error in annual ETR estimates, or ETR Miss, captures both (i) firms' ability to make unbiased accounting estimates and (ii) firms' earnings management activities in response to varying incentives within the year.

3.2 Hypotheses Regarding Determinants of ETR Miss

In accordance with the two dimensions of the construct of ETR Miss, I discuss two sets of hypotheses regarding the determinants of ETR Miss: one set of determinants that affect ETR Miss through predictability, and the other set that affects ETR Miss through earnings management.

3.2.1 Determinants Affecting ETR Miss through Predictability

Assuming unbiased estimation, managers of firms with more predictable business fundamentals are better able to estimate economic outcomes; in this case, intra-year error in annual ETR estimates, or ETR Miss, should be low. In other words, predictability is hypothesized to be negatively associated with ETR Miss.

¹³ Or equivalently, higher ETR Miss allows for (indicates) higher manipulation, and lower ETR Miss allows for (indicates) lower manipulation.

¹⁴ It is possible that higher manipulation could lead to lower ETR Miss if managers see lower ETR Miss as an incentive goal on and of itself. However, since there is no particular reason why managers would set low ETR Miss as a goal in the presence of other incentives such as meeting analysts forecasts, I judge this possibility as unlikely.

To further analyze the impact of predictability on ETR Miss, I discuss four factors through which predictability could affect ETR Miss: (i) permanent differences, which is the main driver causing deviation of ETR from the statutory rate; the volatility of permanent differences decreases the predictability of ETR and thus increases ETR Miss; (ii) tax loss carryforward, which could result in deviation of ETR from the statutory rate when firms cannot generate enough future profits to realize the tax benefit associated with the loss carryforward within the loss carryforward period of 20 years; the existence of tax loss carryforward requires predicting profitability in the long-term, which adds to the difficulty of predicting annual ETR and thus increases ETR Miss; (iii) economic activities eligible for R&D tax credit, which results in deviation of ETR from the statutory rate as tax credits reduce ETR; the availability of R&D tax credit decreases the predictability of ETR and thus increases ETR Miss; and (iv) foreign-sourced earnings that are designated as “permanently reinvested”; ETR is the weighted average of foreign and domestic income tax rates; the scale of foreign operations adds to the difficulty of predicting annual ETR and thus increases ETR Miss.¹⁵

Stated formally (in alternative form), I hypothesize the following relationship between ETR Miss and its determinants through the predictability dimension (the predictability hypothesis).

H_{1a}: Through the predictability dimension, other things equal, ETR Miss is increasing in the volatility of permanent differences, the existence of tax loss carryforward, the availability of R&D tax credit, and the scale of foreign operations.

¹⁵ I discuss specific proxies for each of the four factors in Section 5.1 Research Design for Determinants of ETR Miss.

3.2.2 *Determinants Affecting ETR Miss through Earnings Management*

Assuming biased estimation, managers respond to varying managerial incentives within the year by manipulating annual ETR estimates. The more variable managerial incentives are within the year, the more likely it is for managers to manipulate annual ETR estimates as a last resort to meet the varying incentives at different time of the year; in this case, intra-year error in annual ETR estimates, or ETR Miss, should be high. In other words, earnings management is hypothesized to be positively associated with ETR Miss.¹⁶

To further analyze the impact of earnings management on ETR Miss, I discuss three classes of forces that may influence such impact: (i) managers' flexibility with actual manipulation of annual ETR estimates to meet varying incentives at different time of the year, which increases ETR Miss; (ii) firms' general attitudes towards compliance with regulations, which may strengthen (with aggressive attitudes) or constrain (with conservative attitudes) managers' actual manipulation of annual ETR estimates within the year, and thus increase or decrease ETR Miss, respectively; and (iii) the effectiveness of internal and external monitoring mechanisms in place, which may strengthen (with ineffective monitoring) or constrain (with effective monitoring) managers' actual

¹⁶ The hypothesized positive relationship between ETR Miss and earnings management is partially supported by the empirical evidence in prior research that shows firms boost earnings by decreasing annual ETR estimates when they would have missed analyst earnings forecasts otherwise (Comprix et al. 2012; Cook et al. 2008; Dhaliwal et al. 2004).

manipulation of annual ETR estimates within the year, and thus increase or decrease ETR Miss, respectively.¹⁷

Stated formally (in alternative form), I hypothesize the following relationship between ETR Miss and its determinants through the earnings management dimension (the earnings management hypothesis).

H_{1b}: Through the earnings management dimension, other things equal, ETR Miss is increasing in managers' flexibility with earnings management and firms' aggressiveness towards compliance with regulations, and ETR Miss is decreasing in the effectiveness of monitoring mechanisms in place.

3.3 *Hypotheses Regarding Consequences of ETR Miss: Earnings Persistence*

A direct consequence of intra-year error in annual ETR estimates, or ETR Miss, is one on earnings quality, of which earnings persistence is a commonly studied attribute because of its importance in both the conceptual framework of accounting standards, and in the Ohlson (1995) valuation model (Barth and Hutton 2004; Jonas and Blanchet 2000). Earnings persistence is an especially relevant attribute of earnings quality for assessing the information content of ETR Miss because like ETR Miss, earnings persistence is determined internally by both business fundamentals and managerial discretion.

3.3.1 *Prior Research on Accounting/Tax Choices and Earnings Persistence*

Prior research has investigated whether certain properties of accounting and tax choices contain information relevant for the persistence of firms' pre-tax earnings and

¹⁷ I discuss proxies for the specific channels through which earnings management could affect ETR Miss under each class of forces in Section 5.1 Research Design for Determinants of ETR Miss.

earnings components. In particular, Hanlon (2005) hypothesizes and finds that firm-years with large book-tax differences have earnings that are less persistent than firm-years with small book-tax differences. Following Hanlon (2005), Blaylock et al. (2012) provide further evidence that positive book-tax differences arising from earnings management exhibit less persistent earnings while positive book-tax differences arising from tax avoidance exhibit more persistent earnings. McGuire et al. (2013) hypothesize and find that firms-years with more sustainable tax strategies have earnings that are more persistent than firm-years with less sustainable tax strategies.

3.3.2 *Hypotheses Regarding ETR Miss and Earnings Persistence*

The information content in ETR Miss for indicating earnings persistence differs from that in other tax measures used in prior studies such as book-tax differences and the sustainability of tax strategies, because ETR Miss contains unique information about the predictability of business fundamentals and earnings management; while book-tax differences or the sustainability of tax strategies do not contain such information. In addition, while both book-tax differences and the sustainability of tax strategies are subject to the effects of tax planning, the impact of tax planning on ETR Miss is kept to the minimum.^{18, 19}

¹⁸ In particular, book-tax differences result from *current year* accounting discretion and tax planning; the sustainability of tax strategies results from *long term* tax planning; and ETR Miss mainly results from *current year* accounting discretion.

¹⁹ The impact of tax planning on ETR Miss is kept to the minimum because the accounting standard requires firms to make the best estimates of annual ETR after consideration of available tax planning strategies for the entire year on each interim date; under the reasonable assumption that tax planning strategies take a relatively long time to implement (Schmidt 2006), and firms should have information about their current year tax planning strategies at the beginning of the

Building on Dichev and Tang (2009), who point out the persistence of earnings is the result of both economic and accounting factors, I propose that because the two dimensions (i.e., predictability and earnings management) of intra-year error in annual ETR estimates, or ETR Miss, correspond to such economic and accounting factors, ETR Miss contains unique information relevant for assessing the persistence of firms' pre-tax earnings and earnings components.

In particular, the predictability dimension of ETR Miss (assuming unbiased estimation) indicates a negative association between ETR Miss and earnings persistence because: (i) higher ETR Miss indicates less predictable earnings (as discussed in Section 3.2.1);²⁰ and (ii) less predictable earnings (indicating firms' economic fundamentals from investment and operations) are less persistent (Dichev and Tang 2009). In the meantime, the earnings management dimension of ETR Miss (assuming biased estimation) also indicates a negative association between ETR Miss and earnings persistence because: (i) higher ETR Miss indicates more highly manipulated earnings (as discussed in Section 3.2.2) and (ii) more highly manipulated earnings (indicating firms' financial reporting biases) are less persistent (Dichev and Tang 2009). In sum, ETR Miss is negatively

current year, difference in tax planning should be kept to the minimum for the same firm within the year. As a result, intra-year error in annual ETR estimates (i.e., ETR Miss) is less likely to result from changes in tax planning within the year. On the other hand, tax planning could affect ETR Miss to the extent that managers cannot anticipate it on interim dates; given the accounting rule that requires firms to estimate annual ETR based on all anticipated tax planning strategies for the entire year, better compliance with this accounting rule implies more predictable tax planning.²⁰ Previous discussion on determinants of ETR Miss focuses on how predictability affects ETR Miss through earnings taxed at non-statutory rate. However, under the assumption that the predictability of income taxed at non-statutory rate is positively associated with the predictability of pre-tax income in general, the information content in ETR Miss also indicates the predictability of business fundamentals in general.

associated with earnings persistence because (i) less predictable earnings are less persistent; or (ii) more highly manipulated earnings are less persistent; or both.

To the extent that ETR Miss relates to the subjectivity of accounting accruals, the above prediction (for the relationship between ETR Miss and earnings persistence) should apply to the accruals component of earnings. Alternatively, to the extent that ETR Miss (partially) relates to realized accounting earnings, the above prediction should apply to the cash flow component of earnings.

Stated formally (in alternative form), I hypothesize the following relationship between ETR Miss and the persistence of pre-tax earnings and earnings components.

H_{2a}: Pre-tax earnings persistence decreases with ETR Miss.

H_{2b}: The persistence of the accruals component of earnings decreases with ETR Miss.

H_{2c}: The persistence of the cash component of earnings decreases with ETR Miss.

3.4 Hypotheses Regarding Consequences of ETR Miss: Value Relevance

Accounting information is an essential input for the capital market. Whether ETR Miss contains information relevant for market valuation is an important question for users of the financial statements. The answer to this question depends on two premises: (i) whether ETR Miss contains information on earnings quality, and (ii) whether the market deciphers and incorporates the information in ETR Miss (on earnings quality) for valuation assessment.

If ETR Miss indicates earnings quality (i.e., if the hypothesized relationship between ETR Miss and earnings persistence holds), then in an efficient market, the

implication of ETR Miss on value relevance depends on whether the information in ETR Miss is substantial enough to make a difference for market valuation.²¹ The difficulty of understanding tax-related information by market participants may hinder the actual use of potentially useful information, as evidenced in prior literature: Plumlee (2003) finds that financial analysts are unable to forecast the effects of complex tax law changes; and Weber (2009) finds that both investors and analysts fail to correctly incorporate information in book-tax differences into their earnings expectations. Thus it is an empirical question whether the market can correctly decipher information in ETR Miss for valuation purposes. If the information in ETR Miss is correctly deciphered by market participants, and deemed to be incrementally useful, then the market will incorporate such information for valuation assessment; in this case, market valuation of earnings should change with ETR Miss.

If ETR Miss contains information incrementally useful for valuation purposes, and the market incorporates the information in ETR Miss, the valuation of accounting earnings will be consistent with such information. In particular, if ETR Miss indicates lower quality accounting earnings (the negative relationship between ETR Miss and earnings persistence as discussed in Section 3.3), then investors may attach a lower weight to earnings associated with higher ETR Miss. In other words, the market valuation of accounting earnings should be negatively associated with ETR Miss.

Stated formally (in alternative form), I hypothesize the following relationship between ETR Miss and the value relevance of accounting earnings.

²¹ I rely on prior literature for the efficient market hypothesis to make the claim that incrementally useful information is incorporated by the market for valuation purposes.

H₃: Market valuation of earnings decreases with ETR Miss.

4. Measuring ETR Miss

4.1 Development of the *ETRMiss* Metric

I measure the intra-year error in annual ETR estimates, relative to the actual annual ETR, or the construct of ETR Miss, using the *ETRMiss* metric, which is defined using an **adapted** version of the coefficient of variation of the annual ETR estimates made on the three interim dates of the year. Consistent with prior literature that uses the coefficient of variation as a unitless measure of variability (Albrecht and Richardson 1990; Michelson et al. 1995; Minton and Schrand 1999; Minton et al. 2002), the **unadapted** coefficient of variation of the annual ETR estimates (*Miss_{CV}*) is the standard deviation of the four annual ETR estimates made during the year scaled by the absolute value of the mean annual ETR estimates over the same period.²²

To better address my research question, I modify the coefficient of variation by replacing the mean annual ETR estimates during the year with the actual annual ETR at the year-end in both the numerator and denominator for the computation of *ETRMiss*.

Specifically, $ETRMiss_t = \frac{\sqrt{[\sum_{tq=1}^N (ETR_{tq} - ETR_{ty})^2]/N}}{Abs(ETR_{ty})}$, where ETR_{tq} is annual ETR

estimated on each of the three interim dates,²³ defined as total year-to-date income tax

²² Specifically, $Miss_{CV}_t = \frac{\sqrt{[\sum_{tq=1}^N (ETR_{tq} - Avg ETR_{ty})^2]/N}}{Abs[\frac{1}{N}(\sum_{tq=1}^N ETR_{tq})]}$, where ETR_{tq} is annual ETR estimated at each quarter end (four estimates in a given year), defined as total year-to-date income tax expense divided by total year-to-date pre-tax earnings ($TXTY_{tq}/PIY_{tq}$).

²³ In the main test, I do not require the availability of annual ETR estimates on all three interim dates for a firm-year to be included in the sample (i.e., N could be equal to 1, 2 or 3 for

expense divided by total year-to-date pre-tax earnings ($TXTY_{tq}/PIY_{tq}$); and ETR_{ty} is actual annual ETR at the year-end, defined as annual income tax expense divided by annual pre-tax earnings (TXT_t/PI_t).²⁴ Higher value of $ETRMiss$ indicates higher intra-year error in annual ETR estimates.

$ETRMiss$ is a better measure than $Miss_{CV}$ because of the superiority of the actual annual ETR at the year-end over mean annual ETR estimates within the year as a benchmark to evaluate the intra-year error of annual ETR estimates. In particular, the superiority is due to three reasons: (i) GAAP requires firms to make their best estimate of annual ETR on each interim date; actual annual ETR at the year-end is an easily observable benchmark for financial statement users to evaluate how well firms comply with this accounting rule; (ii) actual annual ETR at the year-end is estimated with more complete information available to estimate firms' economic outcomes; also, uncertainties regarding tax regulations are more likely to be resolved near the year-end as updated guidance or legislation may be available from the tax authorities at that time; and (iii)

$ETRMiss$; N could be equal to 2, 3, or 4 for $Miss_{CV}$). I require the availability of annual ETR estimates on all three interim dates as an alternative sample selection criterion in robustness check. As shown in robustness check, inferences remain the same with this alternative sample selection criterion.

²⁴ ETR_{tq} (year-to-date ETR, or expected annual ETR estimated on each interim date, obtained from Compustat Quarterly) at the end of Q4 should be the same as ETR_{ty} (actual annual ETR at the year-end, obtained from Compustat Annual). However, 9% of my sample shows a difference between the two, though the differences often have small magnitude. By comparing Compustat reported numbers for pre-tax earnings and income tax expense with those in SEC filings for a small sample of firms, I find that Compustat Annual results are correct 80% of the time, while Compustat Quarterly results (Q4 year-to-date results) are correct 20% of the time. I thus use Compustat Annual results for the $ETRMiss$ metric in the main test, with two related robustness checks: (i) using Compustat Quarterly results (Q4 year-to-date results) as the year-end results; and (ii) excluding firm-years with a difference between the two. As shown in robustness check, inferences remain the same with these alternative definitions of $ETRMiss$.

actual annual ETR at the year-end has the additional assurance provided by auditors, which could add to its accuracy and credibility.²⁵

4.2 Sample Selection

I conduct empirical tests for determinants and consequences of ETR Miss using a sample of U.S. firms over 1993-2012 with available annual and quarterly data on Compustat and price data on CRSP.²⁶

Table 1 Panel A describes the sample selection. I start with 184,098 firm-year observations of all U.S. companies listed in Compustat Annual Database. Following Comprix et al. (2012) and Hanlon (2005), I then apply the following exclusion criteria: exclusion of 67,238 firm-year observations with negative pretax income, negative ETRs, or ETRs above 1; exclusion of 16,316 firm-year observations in the financial services industry, with SICs 6726, 6792, 6795, 6798, and 6799; exclusion of 30,170 firm-year observations with missing price data from CRSP; and exclusion of 8,817 firm-year observations with missing data on the *ETRMiss* metric computed from Compustat Quarterly Database. This leaves me with 61,557 firm-year observations with data available for the *ETRMiss* metric in the main sample.²⁷

²⁵ Despite the advantages of *ETRMiss* over *Miss_CV*, I use *Miss_CV* as an alternative measure for ETR Miss, to mitigate the concern that actual annual ETR at the year-end could be manipulated and thus may not be a good benchmark. Inferences remain the same using this alternative measure, as shown in robustness check.

²⁶ Consistent with Hanlon (2005), I choose 1993 as the starting year because of the implementation of ASC 740 (formerly SFAS No. 109) in 1993, which significantly changed the accounting for income taxes.

²⁷ In later sections the main sample is reduced due to data availability for additional variables required for the respective tests. A reconciliation of sample selection between the main sample and the samples used in the particular tests is presented in each section.

Table 1 Panel B (Panel C) presents the industry (annual) sample distribution; there is no evidence of clustering.

[Table 1]

4.3 Descriptive Statistics for the *ETRMiss* Metric

Table 2 provides descriptive statistics for the *ETRMiss* metric in the main sample. Panel A presents descriptive statistics for the four annual ETR estimates made during the year (one estimate at each quarter-end) and the *ETRMiss* metric. The descriptive statistics is consistent with prior study that shows a monotonically decreasing trend of annual ETR estimated from Q1 to Q4 (Comprix et al. 2012).^{28, 29}

Table 2 Panel B presents sample distribution by intra-year ETR trend. Three intra-year ETR trends (for annual ETR estimated from Q1 to Q4) are presented: (i) monotonically increasing (MI); (ii) monotonically decreasing (MD); and (iii) fluctuating (FL). Different from the average effect of the monotonically decreasing trend shown in prior literature, the majority of firm-years show fluctuating rather than strictly monotonically decreasing intra-year trend. In particular, 10.5% (or 5,054 out of 48,255) of all firm-years (with data available for annual ETR for all four quarters) fall in the MI group; 17.5% (or 8,438 out of 48,255) of all firm-years fall in the MD group; and 72.0% (or 34,763 out of 48,255) of all firm-years fall in the FL group.

²⁸ Consistent with prior study (Comprix et al. 2012), *t*-test results show mean Q1 annual ETR estimate is higher than mean Q2 annual ETR estimate; mean Q2 annual ETR estimate is higher than mean Q3 annual ETR estimate; mean Q3 annual ETR estimate is higher than mean Q4 annual ETR estimate; and mean Q4 annual ETR estimate is lower than mean Q1 annual ETR estimate, all statistically significant at the 1% level.

²⁹ I use Q4 estimate of annual ETR interchangeably with actual annual ETR at the year-end.

This observation is even more salient when the distribution is based on unique firms instead of firm-years. Specifically, 4.0% (or 280 out of 7,003) of all firms fall in the MI group; 5.5% (or 382 out of 7,003) of all firms fall in the MD group; and 90.5% (or 6,341 out of 7,003) of all firms fall in the FL group.³⁰ The fact that the majority of firms show fluctuating annual ETR estimates during the year confirms the importance of examining the non-directional intra-year error in annual ETR estimates as a broader construct than the directional changes in intra-year annual ETR estimates; in addition, this fact shows preliminary evidence for either the difficulty of estimating annual ETR on interim dates, or the existence of varying managerial incentives during the year that results in manipulation of annual ETR to achieve after-tax earnings goal at different time of the year.

Table 2 Panel C presents the frequency distribution of repeated firm behaviors under each of the three intra-year ETR trends: MI, MD, and FL, where the intra-year trend is defined for firm-years; the number of repeated behaviors is the maximum number of years the same firm falls into a given intra-year ETR trend during my sample period of 1993-2012; and the frequency distribution is the number of firms exhibiting the corresponding maximum number of repeated behaviors in my sample. The MI group shows up to 8 years of repeated MI trend by the same firms; the MD group shows up to 12 years of repeated MD trend by the same firms; and the FL group shows up to 18 years of repeated FL trend by the same firms.

³⁰ A given firm may fall into MI, MD, or FL in different years. A firm is classified into an intra-year trend if the majority of years of the same firm fall into a particular intra-year trend; firms are excluded from the firm distribution if the majority of years of the same firms do not fall into any of the three intra-year trends.

Table 2 Panel D presents descriptive statistics for the *ETRMiss* metric by intra-year ETR trend, where the intra-year trends are defined for firm-years. The MD group has higher mean and median values of the *ETRMiss* metric (mean of 0.259; median of 0.054) than the MI group (mean of 0.129; median of 0.049) and the FL group (mean of 0.160; median of 0.036), respectively. Table 2 Panel E shows the difference in means and medians between the groups are all statistically significant at the 1% level.

Table 2 Panel F presents results on the persistence of ETR Miss. In particular, time series regression is estimated when current year *ETRMiss* is regressed on prior one year's *ETRMiss* (the first column), or prior two years' *ETRMiss* (the second column). The coefficient on $ETRMiss_{t-1}$ is significantly positive (0.140, t -stat = 16.39 from the one year model; 0.122, t -stat = 11.52 from the two-year model),³¹ consistent with ETR Miss being persistent.

The persistence of ETR Miss is consistent with prior study that documents the persistent overestimation of annual ETR in the interim reports (manifested by the monotonically decreasing intra-year ETR trend) as an average effect. However, taken together with the evidence that the majority of firms have different patterns of intra-year ETR trend (i.e., fluctuating or monotonically increasing), the persistence of ETR Miss suggests that although not exhibited in the average effect, these other patterns of intra-year ETR trend are also persistent and are worth investigating.

[Table 2]

³¹ The coefficient on $ETRMiss_{t-2}$ is also significantly positive (0.087, t -stat = 8.98) from the two-year model.

5. Determinants of ETR Miss

5.1 Research Design for Determinants of ETR Miss

I investigate the determinants of ETR Miss by testing the two hypotheses in accordance with the economic meaning of ETR Miss: (i) the predictability hypothesis, and (ii) the earnings management hypothesis. I describe specific proxies for testing each hypothesis below.

5.1.1 Proxies for Testing the Predictability Hypothesis

Previous discussion posits a negative association between ETR Miss and predictability in general, and positive associations between ETR Miss and each of the four predictability factors in particular: (i) the volatility of permanent differences; (ii) the existence of tax loss carryforward; (iii) the availability of R&D tax credit; and (iv) the scale of foreign operations. I discuss specific proxies for the four factors in detail below.

The Volatility of Permanent Differences

Permanent book-tax differences (PD) is a main source that could cause ETR to deviate from the statutory rate.³² Unlike temporary book-tax differences (TD) such as accelerated depreciation expense that only affects cash tax outflows but does not affect tax accruals (since the effect of TD is included in deferred tax expense/benefit, which is a component of total income tax expense), PD not only affects cash tax outflows, but also affects tax accruals (as the effect of PD never enters income statement through income

³² Two other major sources that could cause deviation of ETR from the statutory rate are: (i) tax credits, and (ii) foreign-sourced earnings. Both are explained in detail below.

tax expense).^{33, 34} As a result, TD does not make ETR different from the statutory rate, while PD makes ETR different from the statutory rate.

Because PD affects ETR, the predictability of PD affects the predictability of annual ETR estimates within the year. As prior literature shows that more volatile business outcomes are harder to predict (Dichev and Tang 2009; Duru and Reeb 2002), the volatility of PD is hypothesized to be negatively associated with predictability and positively associated with ETR Miss.

Empirically, I proxy for PD using pre-tax income minus the difference between total income tax expense and state income tax expense divided by statutory rate. Specifically, $PD = PI - (TXT - TXS - TXDS)/0.35$, where PI is pre-tax book income; TXT is total income tax expense, TXS is current state income tax expense; and $TXDS$ is deferred state income tax expense, all available from Compustat. I define the PD proxy in

³³ Examples of *income* that lead to permanent differences (i.e., non-taxable income) include: (1) interest from municipal bonds; (2) life insurance proceeds; and (3) dividends received from other corporations that qualify for the dividends received deduction (if the ownership is less than 20% of the investee's shares outstanding, then 70% of the income is not taxable; if ownership is between 20% and 80%, then 80% of the income is not taxable; if ownership is over 80%, then 100% of the dividends received are not taxable). Examples of *expense* that lead to permanent differences (i.e., expenses that are not tax deductible) include: (1) 50% of business meals and entertainment; (2) bribes, kickbacks, and other illegal payments; (3) lobbying and other political expenses; (4) premiums paid on life insurance policies; and (5) fines and penalties.

³⁴ Although employee stock options could result in book-tax difference that never reverses, it does not result in permanent differences, because the excess tax benefit (i.e., tax benefit on exercise date, when in excess of the deferred tax asset created at grant date) is credited to additional paid in capital, rather than enter the income statement. This conclusion holds under both prior and current accounting regimes for employee stock options: (i) the APB Opinion No. 25 regime, issued in Oct 1972, which adopts the intrinsic value method that essentially does not require expensing of employee stock options; (ii) the FAS 123 regime, issued in Oct. 1995 (effective for fiscal years beginning after December 15, 1995), which encourages expensing of stock employee options using the fair value method, but still allows APB No. 25 election with note disclosure; and (iii) the FAS 123R regime (now codified within ASC 718), issued in March 2004 (effective for fiscal years beginning after June 15, 2005 for most public companies), which requires expensing of employee stock option using the fair value method and eliminates the intrinsic value method required under APB No. 25 and allowed under FAS 123.

this way because the difference between pre-tax income and PD multiplied by statutory tax rate plus state income tax expense is total income tax expense: $(PI - PD) * 0.35 + TXS + TXDS = TXT$.³⁵

My PD proxy is a broad proxy that not only captures the effects of “pure” permanent differences, but also captures the effects of tax credits and foreign-sourced earnings on ETR.^{36,37} In particular, I keep the effects of tax credit and foreign-sourced earnings on ETR in my broad PD proxy for two reasons: (i) though not being part of PD per se, tax credits and foreign-sourced earnings also cause deviation of ETR from the statutory rate, and thus affect ETR and ETR Miss; as a result, the predictability of the tax credits and foreign-sourced earnings is also important for my research question; and (ii) data on tax credits and federal income tax attributed to foreign-sourced earnings are not readily available from Compustat;³⁸ giving my research question, the benefit of

³⁵ Although my PD proxy is backed out using ETR, PD and ETR are two different things, and they have different properties. In particular, the variance of ETR depends on the variance of pre-tax earnings, while the variance of PD does not necessarily depend on the variance of pre-tax earnings.

³⁶ Technically tax credits need to be deducted from total income tax expense on the right hand side for the above equation to hold. Not deducting tax credits on the right hand side allows the backed out PD to also include the effect of tax credits on ETR.

³⁷ Two types of foreign-sourced earnings can cause deviation of ETR from the statutory rate: (i) foreign earnings at a lower foreign rate that are designated as “permanently reinvested” can cause PD, as firms are not required to accrue deferred tax expense for such foreign earnings; and (ii) foreign earnings at a higher foreign rate can cause PD, because the excess of foreign tax over federal tax can be used to offset federal income tax on foreign earnings from other low tax regions through foreign tax credit. On the other hand, foreign earnings at a lower foreign rate that are not designated as “permanently reinvested” do not cause PD, because firms are required to accrue deferred tax for the difference between the (low) foreign income tax and (high) federal income tax (i.e., these foreign earnings result in temporary differences). Similarly, foreign earnings at an equal rate do not cause PD, as these foreign earnings do not result in book-tax differences.

³⁸ Foreign pre-tax income and foreign income tax expense are available from Compustat. However, in order to separate the effect of foreign-sourced income on ETR from my broad PD proxy, federal income tax expense associated with foreign-sourced earnings also needs to be

separating the effect of tax credits and foreign-sourced earnings from the broad PD proxy is marginal, which does not outweigh the cost of hand collecting data on tax credits and foreign-sourced earnings causing PD (i.e., foreign earnings designated as “permanently reinvested”) from the annual reports.

On the other hand, my PD proxy excludes state income taxes from total income tax expense for two reasons: (i) state income taxes are stable within the year for most firms and thus should not affect ETR Miss; and (ii) state income taxes are a second layer of tax (i.e., levied in addition to the statutory tax rate for federal income tax) on the same income that is already subject to federal income taxes, and thus add to the statutory tax rate to get to ETR.³⁹

The Existence of Tax Loss Carryforward

The existence of tax loss carryforward could affect ETR Miss through predictability, because the realization of the tax benefits associated with the losses depends on firms’

excluded from total federal income tax, which is not possible using Compustat data. In particular, the reported federal income tax expense in Compustat not only includes federal income tax expense on domestic earnings, but also includes federal income tax expense on foreign earnings (which equals the difference between the low foreign income tax and high U.S. income tax): when such foreign earnings are repatriated to the U.S., the differential tax is included in current federal income tax expense; when such foreign earnings are not repatriated to the U.S. and not designated as “permanently reinvested”, the differential tax is included in deferred federal income tax expense. Only foreign earnings that are designated as “permanently reinvested” can be exempt from this requirement (i.e., firms can choose not to accrue deferred tax expense for “permanently reinvested” foreign earnings, which cause permanent differences).

³⁹ Unlike state income taxes, foreign income taxes do not add to the statutory tax rate to get to ETR, because foreign income taxes result from a difference source of income, which is subject to federal income taxes only to the extent that federal income tax is higher than the foreign income tax. In other words, foreign income tax is not levied in addition to the statutory tax rate; instead, foreign income tax is either at a lower rate than the statutory rate, or is at the same rate as the statutory tax rate.

long-term future profitability, i.e., if firms do not think they can generate enough profits to utilize the tax losses within the 20-year net operating loss carryforward period, then they need to create a valuation allowance for the part of tax benefit that is not realizable. The valuation allowance gives rise to PD by reducing the initial tax benefits from the tax loss carryforward. Future revisions of such valuation allowance also affect PD in a similar way. Thus the predictability of the business fundamentals could affect ETR Miss through changes in PD associated with the recoverability of the tax loss carryforward. As a result, the existence of tax loss carryforward is hypothesized to be negatively associated with predictability and positively associated with ETR Miss.⁴⁰

The Availability of R&D Tax Credit

In addition to the PD proxy that captures PD caused by all kinds of tax credits, I also include a proxy for R&D tax credit specifically, because of the popularity and importance of R&D tax credit among firms.

The availability of R&D tax credit could affect ETR Miss through predictability for two reasons. First, the availability and the amount of R&D tax credits depend on the amount of qualified revenue and R&D expenses; firms are thus required to estimate the qualified revenue and R&D expense on an annual basis on each interim date, which adds to firms' difficulty for estimating annual ETR on interim dates. Second, R&D tax credit

⁴⁰ Besides predictability, earnings management could also results in changes in valuation allowance. For example, Frank and Rego (2006) find that discretionary changes in valuation allowance is associated with earnings management incentive to meet analyst forecasts. Because I use the existence of tax loss carryforward rather than discretionary changes in valuation allowance, I see this proxy more of representing predictability than earnings management.

is a temporary tax credit that is subject to frequent renewal, the result of which is not guaranteed; the uncertainty of the tax law also adds to firms' difficulty for predicting annual ETR on interim dates.⁴¹ Overall, the availability of R&D tax credit is hypothesized to be negatively associated with predictability and positively associated with ETR Miss.

The Scale of Foreign Operations

The scale of foreign operations could affect ETR Miss through predictability because ETR is the weighted average of statutory rate and foreign rates where firms have operations in; the weighted average (i.e., the realized ETR) depends on the mix of foreign earnings at different foreign rates (when they are designated as “permanently reinvested”). As a result, the overall importance of foreign operations adds to the difficulty of firms in predicting the mix of foreign earnings on an annual basis on each interim date. The scale of foreign operations is thus hypothesized to be negatively associated with predictability and positively associated with ETR Miss.

5.1.2 Proxies for Testing the Earnings Management Hypothesis

Previous discussion posits an overall positive association between ETR Miss and earnings management, and analyzes the three classes of forces that could affect ETR Miss through earnings management: (i) managers' flexibility with earnings management; (ii)

⁴¹ For example, a recent working paper by Bratten and Hulse (2014) shows that the effects of retroactive extensions of R&D tax credit contribute to the average decrease in ETR from the third to fourth quarter.

firms' general attitudes towards compliance with regulations; and (iii) the effectiveness of monitoring mechanisms. I discuss specific proxies under each class of forces below.

Managers' Flexibility with Earnings Management

I use the scale of foreign operations as a proxy for managers' flexibility with earnings management, because prior studies show that firms with more foreign operations are better able to reallocate earnings to foreign locations to meet financial reporting incentives, e.g., by changing the proportion of foreign earnings designated as "permanently reinvested" (Hanlon and Heitzman 2010; Krull 2004).⁴² When this is the case, the scale of foreign operations serves as an indicator of firms' freedom to manipulate annual ETR estimates when needed (i.e., to meet varying incentives at different time of the year). As a result, the scale of foreign operations is hypothesized to be positively associated with earnings management and ETR Miss.⁴³

Firms' General Attitudes towards Compliance with Regulations

Assuming firms' general attitudes towards compliance with regulations are the overarching forces that guide specific firm behaviors, and firms are persistent in applying

⁴² These studies also show that firms with more foreign operations are better able to reallocate earnings to foreign locations to save taxes. However, this part of the evidence is less relevant for my study because the tax planning associated with foreign operations (e.g., setting up a subsidiary in tax haven) is less likely to vary within the year, and thus should not affect ETR Miss.

⁴³ Although my previous analysis shows that the scale of foreign operations could affect ETR Miss through predictability because of the difficulty associated with predicting the mix of foreign earnings on an annual basis on each interim date, the scale of foreign operations could also affect ETR Miss through EM because of the subjectivity associated with the proportion of foreign earnings that are designated as "permanently reinvested", i.e., whether foreign earnings from low tax regions result in permanent difference or temporary difference could be a matter a classification, which depends on whether the designation is made.

the general attitudes, reflections of such attitudes should be associated with each other. I argue that the earnings management dimension of ETR Miss is one reflection of such general attitudes, and managers' actual manipulation of annual ETR estimates may be strengthened (when the general attitudes are aggressive) or constrained (when the general attitudes are conservative) by the general attitudes. I propose two proxies for firms' general attitudes towards compliance with regulations: (i) firms' tax aggressiveness, and (ii) firms' financial reporting aggressiveness.⁴⁴

Prior studies have shown that firms' tax aggressiveness and financial reporting aggressiveness are positively associated with each other (Frank et al. 2009). The relationship between the two and ETR Miss then depends on whether ETR Miss increases with aggressiveness or conservatism. I argue that the average effect of the monotonically decreasing trend of intra-year annual ETR estimates documented in prior research (Comprix et al. 2012) suggests ETR Miss is more representative of aggressiveness rather than conservatism. This is so for two reasons.

First, accounting standards require unbiased estimation. Although managers have discretion for accounting estimates, the discretion is considered non-aggressive only when allowed under GAAP; on the other hand, deviations from accounting standards

⁴⁴ Although tax aggressiveness and financial reporting aggressiveness are both measured on an annual basis, which may appear different from the intra-year error in annual ETR estimates as captured by ETR Miss, the three may be of the same nature to the extent that they are all reflections of firms' general attitudes towards compliance with regulations.

(such as instilling a systematic bias for annual ETR estimates) should be seen as aggressiveness rather than conservatism.⁴⁵

Second, annual ETR estimated on interim dates (Q1-Q3 YTD ETR) is unaudited, while actual annual ETR at the year-end (or equivalently, Q4 YTD ETR) is audited. If auditors are more conservative than managers (or as conservative as managers, but not less conservative than managers due to litigation and reputation concerns), then actual annual ETR at the year-end should be more conservative than annual ETR estimated on interim dates, other things equal. This argument implies that actual annual ETR at the year-end should be higher than annual ETR estimated on interim dates. However, empirical observation shows the opposite to be true: actual annual ETR at the year-end is lower than annual ETR estimated in earlier quarters, which suggests that managers, rather than auditors, may purposefully and aggressively lower annual ETR estimates to suit their needs at the year-end (in which case auditors do not adjust upward).

If ETR Miss indeed increases with aggressive firm attitudes towards compliance with regulations, then firms' tax aggressiveness and financial reporting aggressiveness are hypothesized to be positively associated with earnings management and ETR Miss.

The Effectiveness of Monitoring Mechanisms

Even when firms face high market pressures for meeting varying incentives at different time of the year and managers are willing to manipulate annual ETR estimates

⁴⁵ The fact that the systematic bias of higher ETR in earlier quarters implies higher tax expenses in earlier quarters should not change this claim, despite the impression that higher expenses earlier may be seen as associated with conservatism.

to meet the varying incentives, effective internal and external monitoring mechanisms can reduce the actual earnings management activities, and reduce ETR Miss. In other words, the effectiveness of monitoring mechanisms is hypothesized to be negatively associated with ETR Miss. I propose four proxies for the effectiveness of monitoring mechanisms: (i) the strength of corporate governance, (ii) the use of auditor provided tax services, (iii) the existence of internal control weakness, and (iv) the existence of earnings restatement.

The strength of corporate governance is a direct measure of the effectiveness of monitoring mechanisms, and is hypothesized to be negatively associated with ETR Miss.

The use of auditor provided tax services could affect monitoring effectiveness to the extent that more careful and accurate annual ETR estimates on interim dates arise as a result of the tax expertise and knowledge sharing of the auditor (assuming communication between tax people and audit people is easier if both groups belong to the same auditor). If this is true, then auditor provided tax services is hypothesized to be positively associated with the monitoring effectiveness and thus negatively associated with ETR Miss. If, on the other hand, auditor provided tax services raises a threat to auditor independence, then auditor provided tax services is expected to be negatively associated monitoring effectiveness and thus positively associated with ETR Miss. Or, if the two forces offset each other, auditor provides tax services may not be associated with ETR Miss.

The existence of internal control weakness is a direct indicator of the ineffectiveness of internal monitoring mechanisms, and is hypothesized to be positively associated with ETR Miss.

The existence of earnings restatement is a stronger and more extreme indicator of the ineffectiveness of monitoring mechanisms, and is hypothesized to be positively associated with ETR Miss.

5.1.3 Variables and Predictions

In accordance with the above analysis, I model ETR Miss as a function of both predictability proxies and earnings management proxies. I specify the model for estimating the determinants of ETR Miss using the following Equation (1).

$$\begin{aligned}
 ETRMiss_t = & \beta_0 + \beta_1 VolPD_t + \beta_2 TLoss_t + \beta_3 RDCR_t + \beta_4 Foreign_t \\
 & + \beta_5 TaxAgg_t + \beta_6 FinAgg_t + \beta_7 Gov_t + \beta_8 ATS_t \\
 & + \beta_9 ICW_t + \beta_{10} RES_t + \beta_{11} \ln MVE_t + \sum_{k=1}^{11} \gamma_k Industry \\
 & + \sum_{t=2002}^{2011} \phi_t Year + \varepsilon_t
 \end{aligned} \tag{1}$$

where *ETRMiss* is the measure for ETR Miss, as defined before; *VolPD* is a measure for the volatility of permanent difference, defined as the coefficient of variation of annual permanent differences over the past five years, with the proxy for permanent differences as defined before; *TLoss* is a measure for the existence of tax loss carry forward (TLCF), defined as an indicator variable equal to one for firm-years with TLCF; *RDCR* is a measure for the availability of R&D tax credit, defined as an indicator variable equal to

one for firm-years with positive values of estimated R&D tax credit;⁴⁶ *Foreign* is a measure for the scale of foreign operation, defined as the absolute value of foreign pre-tax income scaled by total pre-tax income; *TaxAgg* is a measure for firms' tax aggressiveness, defined as cash effective tax rate over the past three years (Dyreng et al. 2008); *FinAgg* is a measure for firms' financial reporting aggressiveness, defined as the absolute value of discretionary accruals from modified Jones model (Dechow et al. 1995; Kothari et al. 2005); *Gov* is a measure for the strength of corporate governance, defined as the percentage of institutional holding (Hartzell and Starks 2003); *ATS* is a measure for the use of auditor provided tax services (ATS), defined as an indicator variable equal to one for firm-years with ATS; *ICW* is a measure for the existence of internal control weakness (ICW) in tax, defined as an indicator variable equal to one for firm-years with ICW in tax; and *RES* is a measure for the existence of earnings restatement (RES), defined as an indicator variable equal to one for firm-years with RES.⁴⁷

In addition to the test variables described above, I include size as a control variable,⁴⁸ where size is measured by *lnMVE*, defined as the natural logarithm of market

⁴⁶ I estimate R&D tax credit using the method described in Bratten and Hulse (2014), where both the regular R&D credit and two alternative R&D credits (i.e., alternative incremental research credit and alternative simplified credit) are considered. Following Bratten and Hulse (2014), I use R&D expenses and sales reported on Compustat (*XRD* and *SALE*) to proxy for qualified research expenses and gross receipts, respectively.

⁴⁷ Alternative measures are used in robustness check for: *ETRMiss*, *TaxAgg*, *FinAgg*, and *ICW*. See Appendix A for details. Inferences remain similar using the alternative measures, as shown in robustness check.

⁴⁸ I include firm size as a control variable rather than form a specific hypothesis for it because the predictions for size are unclear: on the one hand, firm size could be negatively associated with ETR Miss because of (i) the positive relationship between firm size and predictability (in the sense that larger firms tend to have more stable business models resulting in higher predictability), and/or (ii) the negative relationship between firm size and earning management (in the sense that larger firms tend to have better governance resulting in lower earnings

value of equity ($PRCC_F \times CSHO$). I also include industry and year fixed effects.⁴⁹ Full variable definitions are provided in Appendix A.

H_{1a} predicts that through the predictability dimension, ETR Miss is increasing in the volatility of permanent difference ($\beta_1 > 0$: ETR is harder to predict for firms with more volatile permanent differences), the existence of tax loss carryforward ($\beta_2 > 0$: ETR is harder to predict for firms with tax loss carryforward, as recoverability of tax loss carryforward depends on long-term future profitability), the existence of R&D tax credit ($\beta_3 > 0$: ETR is harder to predict for firms with R&D tax credit), and the scale of foreign operations ($\beta_4 > 0$: ETR is harder to predict for firms with more important foreign operations).

H_{1b} predicts that through the earnings management dimension, ETR Miss is increasing in the scale of foreign operations ($\beta_4 > 0$: firms with foreign operations have more flexibility to manipulate earnings through intra-year changes in annual ETR),⁵⁰ firms' tax aggressiveness ($\beta_5 > 0$: firms that are more aggressive in tax planning are more likely to be aggressive in other ways), firms' financial reporting aggressiveness ($\beta_6 > 0$: firms that are more aggressive in financial reporting are more likely to be aggressive in other ways), the existence of internal control weakness in tax ($\beta_9 > 0$:

management); on the other hand, firm size could be positively associated with ETR Miss because of the positive relationship between firm size and earnings management (in the sense that larger firms tend to have higher market pressure resulting in higher cost for missing market expectations and thus higher actual earnings management).

⁴⁹ Industry fixed effects are defined using Fama-French 12 industry classification (Fama and French 1997).

⁵⁰ Note that since the scale of foreign operations is a test variable for both the predictability hypothesis and the earnings management hypothesis, and both hypotheses predict the same positive relationship between ETR Miss and the scale of foreign operations, I cannot differentiate between the two hypotheses based on the test results on the scale of foreign operations.

ineffective internal control is less likely to curtail earnings management through intra-year changes in annual ETR), and the existence of earnings restatement ($\beta_{10} > 0$: ineffective monitoring is less likely to curtail earnings management); and ETR Miss is decreasing in the strength of corporate governance ($\beta_7 < 0$: effective monitoring is more likely to curtail earnings management through intra-year changes in annual ETR).⁵¹

5.2 Descriptive Statistics for Determinants of ETR Miss

Table 3 presents descriptive statistics for variables used for testing the determinants of ETR Miss. Panel A reconciles the main sample (with data available for the *ETRMiss* metric: 61,557 firm-year observations over 1993-2012) to the sample for testing determinants of ETR Miss (17,105 firm-year observations over 2002-2012). The main reason for the reduction in sample size is due to data limitations on internal control weakness (*ICW*) and auditor provided tax service (*ATS*), which are available in Audit Analytics from 2002 and 2000, respectively. Panel B provides descriptive statistics for variables used in this section ($N = 17,105$). Panel C presents correlations, with little evidence of multicollinearity.

[Table 3]

⁵¹ The prediction for auditor provided tax services (*ATS*) can be positive or negative, depending on the assumptions. In particular, ETR Miss is expected to be decreasing in *ATS* ($\beta_8 < 0$) if *ATS* indicates higher quality tax accrual and more effective external monitoring; ETR Miss is expected to be increasing in *ATS* ($\beta_8 > 0$) if *ATS* indicates independence threat and less effective external monitoring.

5.3 Empirical Results for Determinants of ETR Miss

Table 4 presents results testing determinants of ETR Miss ($N = 17,105$ for the full model in Panel A; or $N = 36,815$ for the abbreviated model in Panel B, where *ICW* and *ATS* are excluded to get a larger sample size; the discussion below refers to the full model in Panel A). The results show significantly positive coefficients for *VolPD* (0.003, t -stat = 2.36), *TLoss* (0.112, t -stat = 4.93), *RDCR* (0.067, t -stat = 2.21) *Foreign* (0.520, t -stat = 11.25), *TaxAgg* (0.356, t -stat = 7.18),⁵² *ICW* (0.368, t -stat = 3.35), and *RES* (0.165, t -stat = 3.67); and a significantly negative coefficient for *Gov* (-0.001, t -stat = -2.46), indicating that ETR Miss is increasing in the volatility of permanent difference, the existence of tax loss carryforward, the availability of R&D tax credit, the scale of foreign operations, firms' tax aggressiveness, the existence of internal control weakness in tax, and the existence of earnings restatement, and ETR Miss is decreasing in the strength of corporate governance. Results on *FinAgg* and *ATS* are insignificant. These results are consistent with the hypotheses under H_{1a} and H_{1b} that ETR Miss is affected by factors from both the predictability dimension and the earnings management dimension.

Further analysis of effect size suggests that the scale of foreign earnings (*Foreign*) is the single most important contributor to the explained variance of ETR Miss, where the proportion of the total variance of ETR Miss attributed to the effect of *Foreign* is 2%. The proportion of the total variance attributed to the other six earnings management proxies combined (i.e., *TaxAgg*, *FinAgg*, *Gov*, *ATS*, *ICW*, and *RES*) is 1%; while the

⁵² The presented results on *TaxAgg* are the estimated results multiplied by negative one because the measure used for tax aggressiveness in the main test is cash effective tax rate over the past three years, with higher values of cash ETR indicating *lower* tax aggressiveness, while the interpretation is for *higher* tax aggressiveness.

proportion of the total variance attributed to the other three predictability proxies combined (i.e., *VolPD*, *TLoss*, and *RDCR*) is 0.3%.^{53, 54, 55}

[Table 4]

6. ETR Miss and Earnings Persistence

6.1 Research Design for ETR Miss and Earnings Persistence

I investigate the consequence of ETR Miss on earnings persistence by testing whether the persistence of pre-tax earnings and earnings components (i.e., the accruals and cash flow components of pre-tax earnings) change with the level of ETR Miss. In particular, consistent with prior studies on earnings persistence and properties of accounting/tax choices (Hanlon 2005; McGuire et al. 2013), I estimate the persistence of pre-tax earnings using the following Equation (2a).

$$PTBI_{t+1} = \beta_0 + \beta_1 PTBI_t + \varepsilon_{t+1} \quad (2a)$$

⁵³ The effect size of a single predictor (or a group of predictors) is the proportion of the total variance that is attributed to the effect of this predictor (or group of predictors). The effect size of a single predictor (or a group of predictors) is the unique contribution after accounting for the contributions of all other predictors in the model (i.e., the proportion of variance explained by the single predictor, or the group of predictors that is not explained by all other predictors in the model). The effect size is estimated using partial R-squared. Note that the effect size of a group of predictors is not the same as the sum of the effect size of each predictor in the group because of the correlations between the predictors.

⁵⁴ For comparison, the proportion of the total variance explained by the model (i.e., adjusted R-squared) is about 6%. However, the effect size of all single predictors (or groups of predictors) of the model need not add up to R-squared, because the effect size is the unique contribution after accounting for contributions of all other predictors in the model (R-squared and the sum of the effect size will not be exactly the same unless all predictors in the model are uncorrelated).

⁵⁵ The effect size of the scale of foreign operations is separately presented, rather than grouped with other predictability proxies or other earnings management proxies, because the scale of foreign operations could be a proxy for both predictability and earnings management, as discussed before. The importance of its effect size also necessitates the highlighted separate presentation for the scale of foreign operations.

where $PTBI_{t+1}$ is the one-year-ahead pre-tax book income (PI_{t+1}), and $PTBI_t$ is the current year pre-tax book income (PI_t), both scaled by average total assets for the corresponding year (AT). To examine the consequence of ETR Miss on earnings persistence, I estimate the following Equation (2b).

$$PTBI_{t+1} = \beta_0 + \beta_1 PTBI_t + \beta_2 ETRMiss_t + \beta_3 ETRMiss_t * PTBI_t + \varepsilon_{t+1} \quad (2b)$$

where all variables are as defined before. If firm-years with higher ETR Miss exhibit less persistent pre-tax earnings (either because less predictable earnings are less persistent; or because more highly manipulated earnings are less persistent; or both), then $\beta_3 < 0$, consistent with predictions of H_{2a} that pre-tax earnings persistence decreases with ETR Miss.

To further explore the issue, I estimate the consequence of ETR Miss on the persistence of earnings components. Consistent with prior studies (Hanlon 2005; McGuire et al. 2013), and parallel to Equations (2a) and (2b), I estimate whether ETR Miss affects the persistence of the cash flow component and accruals component of pre-tax earnings using the following Equations (3a) and (3b).

$$PTBI_{t+1} = \beta_0 + \beta_1 PTCF_t + \beta_2 PTACC_t + \varepsilon_{t+1} \quad (3a)$$

$$PTBI_{t+1} = \beta_0 + \beta_1 PTCF_t + \beta_2 PTACC_t + \beta_3 ETRMiss_t + \beta_4 ETRMiss_t * PTCF_t + \beta_5 ETRMiss_t * PTACC_t + \varepsilon_{t+1} \quad (3b)$$

where $PTCF$ is pre-tax cash flow, defined as total operating cash flow less cash flow from extraordinary items plus cash taxes paid ($OANCF - XIDOC + TXPD$); and $PTACC$ is pre-tax accruals, defined as pre-tax book income less pre-tax cash flows ($PTBI -$

PTCF); both are scaled by average total assets (*AT*). All other variables are as defined previously. Full variable definitions are provided in Appendix A.

If firm-years with higher ETR Miss exhibit less persistent pre-tax cash flow and pre-tax accruals, then $\beta_4 < 0$ and $\beta_5 < 0$, consistent with predictions of H_{2b} and H_{2c} that the persistence of the accruals component and that of the cash flow component of pre-tax earnings both decrease with ETR Miss.

6.2 Descriptive Statistics for ETR Miss and Earnings Persistence

Table 5 presents descriptive statistics for variables used for testing the consequence of ETR Miss on earnings persistence and the persistence of earnings components. Panel A reconciles the main sample (with data available for the *ETRMiss* metric: 61,557 firm-year observations over 1993-2012) to the sample for testing the consequence of ETR Miss on earnings persistence and the persistence of earnings components (57,291 firm-year observations over 1993-2012). The main reason for the reduction in sample size is due to the unavailability of one-year ahead pre-tax earnings for fiscal 2012 ($PTBI_{t+1}$). Panel B provides descriptive statistics for variables used in this section ($N = 57,291$). Panel C presents correlations, with little evidence of multicollinearity.

[Table 5]

6.3 Empirical Results for ETR Miss and Earnings Persistence

Table 6 Panel A presents results testing the consequence of ETR Miss on earnings persistence ($N = 57,291$). The results show a significantly negative coefficient for the

interaction term $ETRMiss * PTBI$ (-0.078, t -stat = -7.51), indicating that firm-years with higher ETR Miss exhibit less persistent pre-tax earnings, consistent with the hypothesis under H_{2a} that pre-tax earnings persistence decreases with ETR Miss.

Table 6 Panel B presents results testing the consequence of ETR Miss on the persistence of earnings components ($N = 57,291$). The results show significantly negative coefficients for the interaction terms $ETRMiss * PTCF$ (-0.053, t -stat = -5.39) and $ETRMiss * PTACC$ (-0.059, t -stat = -5.50), indicating that firm-years with higher ETR Miss exhibit less persistent pre-tax cash flows and pre-tax accruals, consistent with the hypothesis under H_{2b} and H_{2c} that the persistence of pre-tax accruals and pre-tax cash flows decrease with ETR Miss.

Taken together, these results indicate that firms with higher ETR Miss exhibit less persistent pre-tax earnings and earnings components, consistent with ETR Miss containing unique information about pre-tax earnings and earnings components.

[Table 6]

7. ETR Miss and Value Relevance

7.1 Research Design for ETR Miss and Value Relevance

I investigate the consequence of ETR Miss on the value relevance of accounting information by testing whether the weights investors place on accounting earnings change with the level of ETR Miss. I conduct this test using long-window associations study rather than short-window event study, because information about ETR Miss is

gradually released during the year, rather than suddenly revealed around earnings announcements dates.

Following theory work of Ohlson (1995) and decades of empirical studies (Collins et al. 1997) on the value relevance of accounting information, I estimate the following Equations (4a) and (4b) for testing the consequence of ETR Miss on the value relevance of accounting information.

$$P_t = \beta_0 + \beta_1 E_t + \beta_2 BV_t + \sum_{k=1}^{11} \gamma_k Industry + \sum_{t=1993}^{2011} \phi_t Year + \varepsilon_t \quad (4a)$$

$$P_t = \beta_0 + \beta_1 E_t + \beta_2 BV_t + \beta_3 ETRMiss_t + \beta_4 ETRMiss_t * E_t + \beta_5 ETRMiss_t * BV_t + \sum_{k=1}^{11} \gamma_k Industry + \sum_{t=1993}^{2011} \phi_t Year + \varepsilon_t \quad (4b)$$

where P is the stock price measured three months after the current fiscal year end; E is earnings per share ($EPSPX$); and BV is book value per share ($BKVLPS$).⁵⁶ All other variables are as defined before. Full variable definitions are provided in Appendix A.

If the information content in ETR Miss is substantial enough to make a difference for market valuation of accounting information, that is, if market recognizes that higher ETR Miss reflects accounting earnings that are less persistent and thus of lower quality, then the market will place a lower weight on earnings associated with higher ETR Miss ($\beta_4 < 0$), consistent with predictions of H_3 that market valuation of earnings decreases with ETR Miss.

⁵⁶ While I estimate the scaled valuation model (i.e., all variables are scaled by the number of shares outstanding) in the main test, I also estimate the unscaled valuation model (i.e., using the total values rather than the per share values for the variables) for robustness check, where I alternatively define $P2$ as total market value of equity, measured three month after the current fiscal year end; $E2$ as total earnings (NI); and $BV2$ as total book values (CEQ).

7.2 Descriptive Statistics for ETR Miss and Value Relevance

Table 7 presents descriptive statistics for variables used for testing the consequence of ETR Miss on the value relevance of accounting information. Panel A reconciles the main sample (with data available for the *ETRMiss* metric: 61,557 firm-year observations over 1993-2012) to the sample for testing the consequence of ETR Miss on the value relevance of accounting information (60,829 firm-year observations over 1993-2012). The reduction in sample size is due to introducing additional variables used in this section. Panel B provides descriptive statistics for variables used in this section ($N = 60,829$). Panel C presents correlations, with little evidence of multicollinearity.

[Table 7]

7.3 Empirical Results for ETR Miss and Value Relevance

Table 8 Panel A presents results testing the consequence of ETR Miss on the value relevance of accounting information using the scaled valuation model ($N = 60,829$). The results show a significantly negative coefficient for *ETRMiss * E* (-1.168, t -stat = -13.41), indicating that investors place a lower weight on accounting earnings associated with higher ETR Miss (indicating less persistent and thus lower quality earnings), consistent with the hypothesis under H_3 that market valuation of earnings decreases with ETR Miss. Also, the results show a significantly positive coefficient for *ETRMiss * BV* (0.148, t -stat = 13.19), indicating that investors place a higher weight on book value associated with higher ETR Miss. Though I do not make a prediction for the valuation of book value, the higher valuation weight for book value associated with higher ETR Miss

is consistent with investors relying more on book value instead of earnings for valuation assessment when earnings are of lower quality.

Table 8 Panel B presents results testing the consequence of ETR Miss on the value relevance of accounting information using the unscaled valuation model ($N = 61,042$). Inferences remain the same as those under the scaled valuation model in Panel A.

Taken together, these results indicate that for firms with higher ETR Miss, investors place a lower weight on the valuation of accounting earnings, consistent with higher ETR Miss indicating less persistent (and lower quality) earnings.

[Table 8]

8. Supplemental Analyses

In previous sections, I have tested the information content of ETR Miss on the quality of *annual* earnings, and whether such information affects the value relevance of annual earnings. In this section, I extend the analysis to *quarterly* earnings as supplemental analysis. In particular, I conduct quarterly analysis for the consequences of ETR Miss on quarterly earnings for: (i) the persistence of quarterly earnings; and (2) the value relevance of quarterly earnings.

8.1 *ETR Miss and the Persistence of Quarterly Earnings*

To test whether ETR Miss contains information about the persistence of quarterly earnings, I re-estimate Equations (2b) and (3b) using quarterly data, where the one-year-ahead earnings from the annual analysis now becomes the four-quarter-ahead earning for

the quarterly analysis.

Table 9 Panel A presents results testing ETR Miss and the persistence of quarterly earnings. Inferences are similar to those from the annual analysis: quarterly earnings associated with higher ETR Miss are less persistent. In particular, for tests of earnings persistence, the results show a significantly negative coefficient for the interaction term $ETRMiss * PTBI$ (-0.060, t -stat = -11.95), indicating that firm-years with higher ETR Miss exhibit less persistent pre-tax earnings, consistent with the hypothesis under H_{2a} that pre-tax earnings persistence decreases with ETR Miss.

For tests of the persistence of earnings components, the results show significantly negative coefficients for the interaction terms $ETRMiss * PTCF$ (-0.055, t -stat = -11.37) and $ETRMiss * PTACC$ (-0.055, t -stat = -11.46), indicating that firm-years with higher ETR Miss exhibit less persistent pre-tax cash flows and pre-tax accruals, consistent with the hypothesis under H_{2b} and H_{2c} that the persistence of pre-tax accruals and pre-tax cash flows decrease with ETR Miss.

8.2 *ETR Miss and the Value Relevance of Quarterly Earnings*

To test whether the information content in ETR Miss affects market valuation of quarterly earnings, I re-estimate Equation (4b) using quarterly data, where quarter fixed effect is included in addition to industry and year fixed effects as in the annual analysis.

Table 9 Panel B presents results testing ETR Miss and the value relevance of quarterly earnings. Inferences are similar to those from the annual analysis: investors place a lower valuation weight on quarterly earnings associated with higher ETR Miss. In

particular, results from both the scaled valuation model and the unscaled valuation model show a significantly negative coefficient for $ETRMiss * E$ (-2.090, t -stat = -13.84 from the scaled valuation model; -3.225, t -stat = -8.48 from the unscaled valuation model), consistent with the hypothesis under H_3 that market valuation of earnings decreases with ETR Miss.

[Table 9]

9. Robustness Check

I conduct a battery of robustness checks to verify the validity of my findings. For each of my three main empirical tests, i.e., (i) the determinants of ETR Miss; (ii) the consequence of ETR Miss on annual earnings persistence; and (iii) the consequence of ETR Miss on the value relevance of annual earnings, I re-run the estimations (i) using alternative measures of the regression variables; and (ii) after alternative sample exclusions. Additionally, for ETR Miss and the value relevance of annual earnings, I also report results from two-stage estimation, to mitigate concerns that determinants of ETR Miss, rather than ETR Miss itself may drive the results.

Further, for all three main empirical tests, I report results for the first half of my sample period (i.e., 1993-2002) and the second half of my sample period (i.e., 2003-2012) separately to see whether the results are robust to alternative sample periods; I also report results for all three tests using an alternative sample selection criterion that requires data availability for annual ETR estimates on all three interim dates for a firm to be included in the sample.

9.1 Robustness Check for Determinants of ETR Miss

Table 10 presents results for robustness check for determinants of ETR Miss. Panel A shows results using alternative definitions of regression variables; Panel B shows results using alternative sample exclusions.

Table 10 Panel A presents results using six alternative measures of regression variables. *Miss_Q4* and *Miss_CV* are alternative measures for *ETRMiss*: *Miss_Q4* uses Q4 year-to-date ETR from Compustat Quarterly to replace year-end annual ETR from Compustat Annual for computation of *ETRMiss* as defined in Appendix A;⁵⁷ *Miss_CV* is the unadapted coefficient of variation of the four annual ETR estimates made during the year.⁵⁸ *GAAPETR3YR* and *UTB* are alternative measures for *TaxAgg*. *Abs_PMDAC* is an alternative measure for *FinAgg*. *ICW_Gen* is an alternative measure for *ICW*.

Overall, the results are similar to those from the main test, with the exception of *UTB*, where several determinants (i.e., *VolPD*, *RDCR*, *RES*) become insignificant. This could be due to reduced power resulting from a much smaller sample size (the sample size is about one third of that in other specifications), since unlike other regression variables, data for *UTB* is only available from 2007 onwards.

Table 10 Panel B presents results after four alternative sample exclusions: (i) after

⁵⁷ This alternative measure is used because although actual annual ETR at the year-end from Compustat Annual should be the same as Q4 year-to-date ETR from Compustat Quarterly, 9% of my main sample (or 5,159 out of 49,367 firm-year observations with data available for both) shows different numbers between the two.

⁵⁸ This alternative measure is used to mitigate the concern some people may have that since prior literature finds actual annual ETR at the year-end could be manipulated to meet analyst forecasts, it may not be a good benchmark for the unobservable “true” or “unmanaged” annual ETR, in which case the mean annual ETR estimates during the year could serve as a better benchmark.

excluding special items from Compustat Annual (Compustat data item *SPI*);⁵⁹ (ii) after excluding special items from Compustat Quarterly (Compustat data item *SPIQ*);⁶⁰ (iii) after excluding all financial (SIC 6000-6999) and utility (SIC 4900-4999) firms; and (iv) after excluding firm-years with different Q4 year-to-date ETR (from Compustat Quarterly) and year-end annual ETR (from Compustat Annual). Results from both the full model (with all determinates included) and the abbreviated model (with *ATS* and *ICW* excluded) are presented.

Results are similar to those from the main test, with the exception of sample exclusion for special items, where two determinants (i.e., *VolPD*, *RES*) become insignificant or less significant. This could be due to special items being a major contributor to the intra-year error in annual ETR estimates (thus excluding special items makes the results weaker), or it could be due to reduced power resulting from a much smaller sample size (the sample size is one third of that before sample exclusion), since special items are a frequent occurrence in my sample.⁶¹

[Table 10]

⁵⁹ I exclude firm-years with special items because the integral method for income tax expense only applies to recurring earnings from continuing operations; while the discrete method is required for infrequent or unusual items. Because income tax expenses for infrequent or unusual items are not reported separately, I exclude firm-years with special items to mitigate noises introduced by these items.

⁶⁰ Special items reported by Compustat Annual and Compustat Quarterly are similar with minor differences.

⁶¹ The fact that results from the abbreviated model in Columns (5) – (8) show higher significance levels for *VolPD* and *RDCR* than those from the full model in Columns (1) – (4) lends some support for lack of power as an explanation, since the abbreviated model has a much larger sample size than the full model; on the other hand, the insignificance of *RES* in the abbreviated model after excluding special items suggests special items may be a major contributor to the relationship between earnings restatement and ETR Miss.

9.2 Robustness Check for ETR Miss and Earnings Persistence

Table 11 presents results for the consequence of ETR Miss on earnings persistence. Panel A shows results using alternative definitions of regression variables; Panel B shows results using alternative sample exclusions.

Table 11 Panel A presents results using three alternative measures of regression variables. *Miss_Q4* and *Miss_CV* are alternative measures for *ETRMiss*, as defined and explained before. *OI* represents alternative measures for pre-tax earnings and earnings components, which uses operating income and operating accruals instead of total pre-tax income and pre-tax accruals.⁶²

Table 11 Panel B presents results after four alternative sample exclusions: (i) after excluding special items from Compustat Annual (Compustat data item *SPI*); (ii) after excluding special items from Compustat Quarterly (Compustat data item *SPIQ*); (iii) after excluding all financial (SIC 6000-6999) and utility (SIC 4900-4999) firms; and (iv) after excluding firm-years with different Q4 year-to-date ETR (from Compustat Quarterly) and year-end annual ETR (from Compustat Annual), for reasons discussed before.

Results for both Panel A and Panel B are similar to those from the main test: the interaction terms *ETRMiss * PTBI*; *ETRMiss * PTCF*; and *ETRMiss * PTACC* show significantly negative coefficients in all model specifications, consistent with firms with higher ETR Miss exhibit less persistent pre-tax earnings and earnings components.

[Table 11]

⁶² This alternative measure is used to test whether ETR Miss contains information about the persistence of operating income, which excludes the impact of one-time events.

9.3 Robustness Check for ETR Miss and Value Relevance

Table 12 presents results for the consequence of ETR Miss on value relevance from the scaled valuation model (i.e., the main specification). Panel A shows results using alternative definitions of regression variables; Panel B shows results using alternative sample exclusions; Panel C shows results from two-stage estimation.

Table 12 Panel A presents results using two alternative measures of regression variables. In particular, *Miss_Q4* and *Miss_CV* are both alternative measures for *ETRMiss*, as defined and explained before.

Table 12 Panel B presents results after four alternative sample exclusions: (i) after excluding special items from Compustat Annual (Compustat data item *SPI*); (ii) after excluding special items from Compustat Quarterly (Compustat data item *SPIQ*); (iii) after excluding all financial (SIC 6000-6999) and utility (SIC 4900-4999) firms; and (iv) after excluding firm-years with different Q4 year-to-date ETR (from Compustat Quarterly) and year-end annual ETR (from Compustat Annual), for reasons discussed before.

Table 12 Panel C presents results from two-stage estimation, to mitigate concerns that the determinants of ETR Miss, rather than ETR Miss itself may drive the results. In particular, discretionary ETR Miss is tested in the second stage instead of total ETR Miss. Discretionary ETR Miss is estimated as the residual value from the first stage model, where ETR Miss is modeled as a function of its determinants specified in Equation (1).

Results for all three panels (i.e., Panel A, Panel B, and Panel C) are similar to those from the main test: the interaction term *ETRMiss * E* shows significantly negative

coefficients in all model specifications,⁶³ consistent with the market placing a lower valuation weight on earnings associated with higher ETR Miss.

[Table 12]

9.4 Robustness Check Using Alternative Sample Period

Table 13 presents results for the first half of the sample period (i.e., 1993-2002) and the second half of the sample period (i.e., 2003-2012) separately to see whether the results are robust to alternative sample periods. Panel A shows results using alternative sample period for testing determinants of ETR Miss; Panel B shows results using alternative sample period for testing ETR Miss and earnings persistence; Panel C shows results using alternative sample period for testing ETR Miss and value relevance.

Table 13 Panel A shows results for determinants of ETR Miss using the abbreviated model, to ensure comparability between the two sample periods. Results are similar to those from the main test with the following differences: (i) in the first half of the sample period: *RDCR* (significant at the 0.05 level) and *FinAgg* (significant at the 0.1 level) are less significant than in the main test (*RDCR* and *FinAgg* are significant at the 0.01 and 0.05 level in the main test respectively), and *RES* is insignificant (*RES* is significant at the 0.01 level in the main test); and (ii) in the second half of the sample period: *VolPD* (significant at the 0.1 level), *RDCR* (significant at the 0.05 level) and *Gov* (significant at the 0.05 level) are less significant (*VolPD*, *RDCR*, and *Gov* are all significant at the 0.01 level in the main test); and *FinAgg* is insignificant (*FinAgg* is significant at the 0.05

⁶³ Results from all specifications are significant at the 0.01 level.

level in the main test).

Table 13 Panel B shows results for ETR Miss and earnings persistence. Results are similar to those from the main test except that the persistence of the cash component is less significant in the first half of the sample period (significant at the 0.05 level; it is significant at the 0.01 level in the main test).

Table 13 Panel C shows results for ETR Miss and value relevance. Results are similar to those from the main test for both the first half and the second half of the sample period.

[Table 13]

9.5 *Robustness Check Using Alternative Sample Selection*

Table 14 presents results using an alternative sample selection criterion that requires data availability for annual ETR estimates on all three interim dates for a firm to be included in the sample. This more stringent data requirement results in a smaller sample size compared with that in the main test. Panel A shows results using alternative sample selection for testing determinants of ETR Miss; Panel B shows results using alternative sample selection for testing ETR Miss and earnings persistence; Panel C shows results using alternative sample selection for testing ETR Miss and value relevance.

Table 14 Panel A shows results for determinants of ETR Miss. Column (1) presents results from the full model, and Column (2) presents results from the abbreviated model. For both models, results are similar to those from the main test, except that *RES* is insignificant in the full model and less significant (significant at the 0.05 level) in the

abbreviated model using this alternative sample selection (*RES* is significant at the 0.01 level in the main test).

Table 14 Panel B shows results for ETR Miss and earnings persistence, and Panel C shows results for ETR Miss and value relevance. Despite the smaller sample size, results for both earnings persistence and value relevance using the alternative sample selection are similar to those from the main test.

[Table 14]

10. Conclusion

Prior literature documents a monotonically decreasing trend of annual ETR estimates from Q1 to Q4 as an average effect. My study shows that although not manifested in the average effect, the majority of firms show different patterns of intra-year ETR trend (i.e., fluctuating and monotonically increasing) that also persists. Based on this observation, I examine why firms are willing to, and able to, maintain persistent intra-year error in annual ETR estimates, despite the GAAP requirement that firms should make their best estimate of annual ETR on each interim date, and the fact that regulators and investors can evaluate how well firms comply with this accounting standard by observing realized intra-year error ex post.

I find that intra-year error in annual ETR estimates, or ETR Miss, is driven by the predictability of business fundamentals that result in deviation of ETR from the statutory rate, as well as earnings management considerations relating to varying managerial incentives within the year. Specifically, my results show that ETR Miss is positively

associated with the volatility of permanent differences, the existence of tax loss carryforward, the availability of R&D tax credit, the scale of foreign earnings, firms' tax aggressiveness, the existence of internal control weakness, the existence of earnings restatement, and ETR Miss is negatively associated with the strength of corporate governance. Further, I find that ETR Miss contains unique information on earnings quality, and such information is incorporated by the market for valuation assessments.

My study has implications for standard setters, financial statement users, as well as academics. By exploring the puzzle of why interim estimates of annual ETR do not converge to actual annual ETR at the year-end, my findings suggest ETR Miss could be used as a summary measure for firms' compliance with GAAP, ability to predict business outcome, inclination to manipulate earnings through tax accounts, and earnings quality. In addition, my study provides a specific channel through which the quality of accounting estimates, earnings quality, and the value relevance of accounting information are linked.

Appendix A
Variable Definitions

Variables Used in the Estimation of Equation (1): Determinants of ETR Miss	
<i>Outcome Variable</i>	
<i>ETRMiss_t</i>	<p>Intra-year error in annual effective tax rate (ETR) estimates relative to the actual annual ETR for firm <i>i</i> in year <i>t</i>, defined using an adapted version of the coefficient of variation for annual ETR estimates made on the three interim dates of the year.</p> <p>While the unadapted coefficient of variation of annual ETR estimates (<i>Miss_CV</i>) is calculated as the standard deviation of the four annual ETR estimates in year <i>t</i> scaled by the absolute value of the mean of the four annual ETR estimates during the same year <i>t</i>, the adapted version for my <i>ETRMiss</i> measure is constructed by replacing the mean annual ETR estimates with the actual annual ETR at the year-end:</p> $ETRMiss_t = \frac{\sqrt{[\sum_{tq=1}^N (ETR_{tq} - ETR_{ty})^2] / N}}{Abs(ETR_{ty})}$ <p><i>ETR_{tq}</i>, annual ETR estimated on each of the three interim date, is defined as total year-to-date income tax expense divided by total year-to-date pre-tax earnings (<i>TXTY_{tq}</i>/<i>PIY_{tq}</i>), obtained from Compustat Quarterly.</p> <p><i>ETR_{ty}</i>, actual annual ETR at the year-end, is defined as annual income tax expense divided by annual pre-tax earnings (<i>TXT_t</i>/<i>PI_t</i>), obtained from Compustat Annual.</p> <p>The adapted coefficient of variation (i.e., <i>ETRMiss</i>) is used in the main test; the unadapted coefficient of variation (i.e., <i>Miss_CV</i>) is used in robustness check. In robustness check, I also define an alternative measure of ETR Miss using <i>Miss_Q4</i>, which is constructed by replacing actual annual ETR at the year-end (from Compustat Annual) with year-to-date ETR at the end of Q4 (from Compustat Quarterly) in the computation of <i>ETRMiss</i>.</p>
<i>Test Variables</i>	
<i>VolPD_t</i>	The volatility of permanent differences for firm <i>i</i> in year <i>t</i> ,

	<p>defined as the coefficient of variation for annual permanent differences over the past five years.</p> <p>The coefficient of variation for annual permanent differences over the past five years is calculated as the standard deviation of annual permanent differences from year $t - 4$ to year t scaled by the absolute value of the mean of annual permanent differences over the same five-year period.</p> <p>Permanent differences (PD) is calculated as pre-tax income (PI) minus the difference between total income tax expense (TXT) and state income tax expense ($TXS + TXDS$) divided by statutory rate: $PD = PI - (TXT - TXS - TXDS)/0.35$.</p> <p>Permanent differences is calculated this way because the difference between pre-tax income and permanent differences multiplied by statutory tax rate plus state income tax expense is total income tax expense: $(PI - PD) * 0.35 + TXS + TXDS = TXT$.</p>
$TLoss_t$	A dummy variable representing the existence of tax loss carryforward for firm i in year t . $TLoss$ is coded one when Compustat tax loss carry forward ($TLCF$) has a positive value, and zero otherwise.
$RDCR_t$	<p>A dummy variable representing the availability of R&D tax credit for firm i in year t. $RDCR$ is coded one when the estimated R&D tax credit has a positive value, and zero otherwise.</p> <p>I estimate R&D tax credit using the method described in Bratten and Hulse (2014), where both the regular R&D tax credit and two alternative R&D tax credits (i.e., alternative incremental research credit and alternative simplified credit) are considered. Following Bratten and Hulse (2014), I use R&D expenses and sales reported on Compustat (XRD and $SALE$) to proxy for qualified research expenses and gross receipts, respectively.</p>
$Foreign_t$	The scale of foreign earnings, defined as the absolute value of foreign pre-tax income scaled by total pre-tax income ($PIFO_t/PI_t$).
$TaxAgg_t$	Tax aggressiveness for firm i in year t , proxied by one of the following three measures: $CashETR3YR_t$; $GAAPETR3YR_t$; and UTB_t , each as defined below.

$CashETR3YR_t$	<p>Cash effective tax rate for firm i, year t over the three prior years, calculated as the sum of three years' cash taxes paid, divided by the sum of three years' pretax net income ($\sum_{i=t-2}^t TXPD_i / \sum_{i=t-2}^t PI_i$).</p> <p>This measure is used in the main test.</p>
$GAAPETR3YR_t$	<p>GAAP effective tax rate for firm i, year t over the three prior years, calculated as the sum of three years' tax expense, divided by the sum of three years' pretax net income ($\sum_{i=t-2}^t TXT_i / \sum_{i=t-2}^t PI_i$).</p> <p>This measure is used in robustness check.</p>
UTB_t	<p>Unrecognized tax benefit for firm i in year t, calculated as the ending balance of the FIN 48 unrecognized tax benefit liability scaled by total assets ($TXTUBEND_t/AT_t$).</p> <p>This measure is used in robustness check.</p>
$FinAgg_t$	<p>Financial reporting aggressiveness for firm i in year t, proxied by one of the following two measures: Abs_DAC_t; and Abs_PMDAC_t, each as defined below.</p>
Abs_DAC_t	<p>Absolute value of discretionary accruals for firm i in year t, where discretionary accruals is estimated as the residual value from modified Jones model (Dechow et al. 1995; Frank et al. 2009).</p> <p>This measure is used in the main test.</p>
Abs_PMDAC_t	<p>Absolute value of performance-matched discretionary accruals for firm i in year t, where performance-matched discretionary accruals is estimated as the difference between the residual value from modified Jones model (DAC_t) and its industry median (Francis et al. 2005; Frank et al. 2009).</p> <p>This measure is used in robustness check.</p>
Gov_t	<p>Strength of corporate governance for firm i in year t, proxied by the percentage of institutional holding (Hartzell and Starks 2003).</p> <p>The percentage of institutional holding is calculated as the percentage of outstanding common shares held by 13(f) institutional investors for firm i at the end of year t from Thomson Financial's CDA Spectrum S34 database.</p>
ATS_t	<p>A dummy variable representing the use of auditor provided tax services by firm i in year t. ATS is coded one if the tax fee</p>

	variable in Audit Analytics (<i>TAX_FEES</i>) has a positive value, and zero otherwise.
<i>ICW_t</i>	Internal control weakness for firm <i>i</i> in year <i>t</i> , proxied by one of the following two measures: <i>ICW_TAX_t</i> ; and <i>ICW_Gen_t</i> , each as defined below.
<i>ICW_TAX_t</i>	Internal control weakness in tax, a dummy variable representing the existence of tax-related internal control weakness for firm <i>i</i> in year <i>t</i> . <i>ICW_TAX</i> is coded one if a tax related reason for SOX 404 or SOX 302 internal control weakness is given by Audit Analytics (<i>NOTEFF_ACC_REAS_KEYS</i> contains the value of “41”), and zero otherwise. This measure is used in the main test.
<i>ICW_Gen_t</i>	General internal control weakness, a dummy variable representing the existence of internal control weakness (for all reasons) for firm <i>i</i> in year <i>t</i> . <i>ICW_Gen</i> is coded one if a SOX 404 or SOX 302 internal control weakness is provided in Audit Analytics, and zero otherwise. This measure is used in robustness check.
<i>RES_t</i>	A dummy variable representing the existence of restatement for firm <i>i</i> in year <i>t</i> . <i>RES</i> is coded one if it is provided in Audit Analytics, and zero otherwise.
Control Variable	
<i>lnMVE_t</i>	Natural logarithm of market value of equity for firm <i>i</i> in year <i>t</i> (<i>PRCC_t</i> × <i>CSHO_t</i>).
Variables Used in the Estimation of Equations (2) and (3): Consequence of ETR Miss on Earnings Persistence	
Outcome Variable	
<i>PTBI_{t+1}</i>	Pre-tax book income for firm <i>i</i> in year <i>t</i> + 1, scaled by average total assets (<i>PI_{t+1}</i> / <i>AVETA_t</i>). <i>AVETA_t</i> is average total assets for firm <i>i</i> in year <i>t</i> (<i>(AT_{t-1} + AT_t)/2</i>). I alternatively define <i>PTBI2_{t+1}</i> as operating earnings after depreciation for firm <i>i</i> in year <i>t</i> + 1 scaled by average total assets (<i>OIADP_{t+1}</i> / <i>AVETA_t</i>), consistent with Sloan (1996). This alternative measure is referred to under the heading of <i>OI</i> in robustness check.

	For quarterly analysis, $PTBI_{t+1}$ is the four-quarter ahead pre-tax book income scaled by average total assets ($PIQ_{q+4}/AVETA_q$), where $AVETA_q$ is average total assets for firm i in quarter q ($(ATQ_{q-1} + ATQ_q)/2$).
Test Variables	
$ETRMiss_t$	Intra-year error in annual ETR estimates relative to the actual annual ETR for firm i in year t , as previously defined.
$PTBI_t$	Pre-tax book income for firm i in year t , scaled by average total assets ($PI_t/AVETA_t$). I alternatively define $PTBI2_t$ as operating earnings after depreciation for firm i in year t scaled by average total assets ($OIADP_t/AVETA_t$), consistent with Sloan (1996). This alternative measure is referred to under the heading of OI in robustness check. For quarterly analysis, $PTBI_t$ is current quarter pre-tax book income scaled by average total assets ($PIQ_q/AVETA_q$).
$PTCF_t$	Pre-tax cash flow for firm i in year t , scaled by average total assets. Pre-tax cash flow equals total operating cash flow less cash flow from extraordinary items plus cash taxes paid ($OANCF_t - XIDOC_t + TXPD_t$). For quarterly analysis, $PTCF_t$ is current quarter pre-tax cash flow scaled by average total assets. Current quarter pre-tax cash flow equals year-to-date pre-tax cash flow of the current quarter minus year-to-date pre-tax cash flow of the prior quarter. Year-to-date pre-tax cash flow equals total operating cash flow less cash flow from extraordinary items plus cash taxes paid ($OANCFY_q - XIDOCY_q + TXPDY_q$).
$PTACC_t$	Pre-tax accruals for firm i in year t , scaled by average total assets. Pre-tax accruals equal pre-tax book income less pre-tax cash flows ($PTBI_t - PTCF_t$). I alternatively define $PTACC2_t$ as pre-tax operating accruals for firm i in year t , scaled by average total assets. Pre-tax operating accruals equal operating earnings after depreciation less pre-tax cash flows ($PTBI2_t - PTCF_t$). This alternative measure is referred to under the heading of OI in robustness check. For quarterly analysis, $PTACC_t$ is current quarter pre-tax accruals, scaled by average total assets. Current quarter pre-tax

	accruals equal current quarter pre-tax book income less current quarter pre-tax cash flows ($PTBI_t - PTCF_t$).
Variables Used in the Estimation of Equation (4): Consequence of ETR Miss on Value Relevance	
Outcome Variable	
P_t	<p>Stock price for firm i in year t, measured three months after the current fiscal year end.</p> <p>Alternatively, I define $P2_t$ as unscaled (i.e., total) market value of equity for firm i in year t, measured three month after the current fiscal year end.</p> <p>For quarterly analysis, P_q is stock price for firm i in quarter q, measured three months after the current fiscal quarter end; and $P2_q$ is unscaled (i.e., total) market value of equity for firm i in quarter q, measured three month after the current fiscal quarter end.</p>
Test Variables	
$ETRMiss_t$	Intra-year error in annual ETR estimates relative to the actual annual ETR for firm i in year t , as previously defined.
E_t	<p>Earnings per share for firm i in year t ($EPSPX$).</p> <p>Alternatively, I define $E2_t$ as unscaled (i.e., total) earnings for firm i in year t (NI).</p> <p>For quarterly analysis, E_q is earnings per share for firm i in quarter q ($EPSPXQ$); and $E2_q$ is unscaled quarterly earnings for firm i in quarter q (NIQ).</p>
BV_t	<p>Book value per share for firm i in year t ($BKVLPS$).</p> <p>Alternatively, I define $BV2_t$ as unscaled (i.e., total) book value for firm i in year t (CEQ).</p> <p>For quarterly analysis, BV_q is book value per share for firm i in quarter q, defined as total book value divided by number of common shares outstanding ($CEQQ/CSHOQ$); and $BV2_q$ is unscaled book value for firm i in quarter q ($CEQQ$).</p>

Table 1
Sample Selection and Distribution

Panel A. Sample Selection		
All U.S. firm-years during 1993-2012 with data on Compustat Annual Database		184,098
Less:		
Firm-years with negative pretax income, negative ETRs, or ETRs above 1	67,238	
Firm-years in the financial services industry (SICs 6726, 6792, 6795, 6798, and 6799)	16,316	
Firm-years with missing data from CRSP	30,170	
Firm-years with missing data on <i>ETRMiss</i> from Compustat Quarterly Database	8,817	
Main Sample with Data Available for the <i>ETRMiss</i> Metric (1993-2012)		<u>61,557</u>
 Panel B. Industry Distribution		
Industry	N	%
1 Consumer NonDurables	3,525	5.7
2 Consumer Durables	1,603	2.6
3 Manufacturing	6,980	11.3
4 Oil, Gas, and Coal Extraction and Products	2,096	3.4
5 Chemicals and Allied Products	1,549	2.5
6 Business Equipment	9,164	14.9
7 Telephone and Television Transmission	1,110	1.8
8 Utilities	2,273	3.7
9 Wholesale, Retail, and Some Services	6,798	11.0
10 Healthcare, Medical Equipment, and Drugs	4,051	6.6
11 Finance	15,177	24.7
12 Other	7,231	11.8
Total firm-years		<u>61,557</u> 100.0

Table 1 (continued)

Panel C. Distribution by Year

Year	N	%	Year	N	%
1993	3,199	5.2	2003	2,846	4.6
1994	3,971	6.5	2004	2,988	4.9
1995	3,997	6.5	2005	3,001	4.9
1996	4,124	6.7	2006	2,999	4.9
1997	4,113	6.7	2007	2,797	4.5
1998	3,783	6.2	2008	2,205	3.6
1999	3,532	5.7	2009	2,106	3.4
2000	3,262	5.3	2010	2,397	3.9
2001	2,740	4.5	2011	2,382	3.9
2002	2,786	4.5	2012	2,329	3.8
Total				61,557	100.0

This table presents sample selection and distribution for my study. Panel A presents the sample selection; Panel B presents the industry distribution (defined using the Fama and French (1997) 12 industry classification); and Panel C presents the annual distribution.

Table 2
Descriptive Statistics for the *ETRMiss* Metric

Panel A. Annual ETR Estimates and the <i>ETRMiss</i> Metric					
Variable	Mean	Std. Dev.	25%	Median	75%
<i>Q1_Annual_ETR</i>	0.338	0.104	0.311	0.360	0.390
<i>Q2_Annual_ETR</i>	0.337	0.103	0.308	0.359	0.390
<i>Q3_Annual_ETR</i>	0.335	0.106	0.302	0.356	0.389
<i>Q4_Annual_ETR</i>	0.333	0.116	0.293	0.352	0.388
<i>ETRMiss</i>	0.329	1.043	0.015	0.048	0.172

Panel B. Distribution by Intra-year ETR Trend

Trend	Firm-years		Firms	
	<i>N</i>	%	<i>N</i>	%
Monotonically Increasing (MI)	5,054	10.5	280	4.0
Monotonically Decreasing (MD)	8,438	17.5	382	5.5
Fluctuating (FL)	34,763	72.0	6,341	90.5
Total	48,255	100.0	7,003	100.0

Table 2 (continued)**Panel C.** Distribution by Number of Repeated Firm Behaviors under Each Trend

No.	MI		MD		FL	
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%
1	2,082	63.8	2,202	51.3	1,786	23.4
2	765	23.4	1,011	23.6	1,342	17.6
3	285	8.7	532	12.4	888	11.7
4	92	2.8	290	6.8	707	9.3
5	31	0.9	147	3.4	481	6.3
6	7	0.2	69	1.6	443	5.8
7	2	0.1	24	0.6	371	4.9
8	1	0.0	9	0.2	304	4.0
9	0	0.0	3	0.1	276	3.6
10	0	0.0	3	0.1	253	3.3
11	0	0.0	0	0.0	241	3.2
12	0	0.0	1	0.0	172	2.3
13	0	0.0	0	0.0	155	2.0
14	0	0.0	0	0.0	104	1.4
15	0	0.0	0	0.0	60	0.8
16	0	0.0	0	0.0	22	0.3
17	0	0.0	0	0.0	12	0.2
18	0	0.0	0	0.0	3	0.0
Total	3,265	100.0	4,291	100.0	7,620	100.0

Panel D. Descriptive Statistics of *ETRMiss* by Intra-year ETR Trend

Trend	Mean	Std. Dev.	25%	Median	75%
MI	0.129	0.268	0.016	0.049	0.141
MD	0.259	0.844	0.022	0.054	0.153
FL	0.160	0.563	0.012	0.036	0.110

Panel E. Test of Difference in *ETRMiss* by Intra-year ETR Trend

Difference	MI vs. MD	MI vs. FL	MD vs. FL
Mean Diff	-0.130***	-0.031***	0.099***
<i>t</i> -Test <i>p</i> -Value	0.000	0.000	0.000
Median Diff	-0.005***	0.013***	0.018***
Median Test <i>p</i> -Value	0.000	0.000	0.000

Table 2 (continued)

Panel F. Persistence of ETR Miss

Variable	Prior One Year		Prior Two Years	
	Coeff.	t-stat.	Coeff.	t-stat.
Intercept	0.190***	(43.78)	0.154***	(34.45)
<i>ETRMiss</i>_{t-1}	0.140***	(16.39)	0.122***	(11.52)
<i>ETRMiss</i>_{t-2}			0.087***	(8.98)
Adjusted- <i>R</i> ²	2%		3%	
<i>N</i>	46,900		36,811	

This table presents descriptive statistics for the *ETRMiss* metric.

Panel A presents descriptive statistics for annual ETR estimated at different time of the year (three estimates on interim dates and one estimate at the year-end) and the *ETRMiss* metric.

Panel B presents sample distribution by intra-year ETR trend, with data available for expected annual ETR at the end of all four quarters (totaling 48,255 firm-years). The first two columns show the distribution for firm-years; the next two columns show the distribution for unique firms. Three intra-year ETR trends are presented: (i) monotonically increasing (MI); (ii) monotonically decreasing (MD); and (iii) fluctuating (FL). For firm-year distribution, the MI group consists of firm-years with Q1 Annual ETR < Q2 Annual ETR < Q3 Annual ETR < Q4 Annual ETR; the MD group consists of firm-years with Q1 Annual ETR > Q2 Annual ETR > Q3 Annual ETR > Q4 Annual ETR; and the FL group consists of firm-years that do not fall into the other two groups. For firm distribution, the MI group consists of firms with the majority of years falling into MI; the MD group consists of firms with the majority of years falling into MD; and the FL group consists of firms with the majority of years falling into FL; firms who do not have the majority of years falling into any of the three groups are excluded from the firm distribution.

Panel C presents the frequency distribution of repeated firm behaviors under each of the three intra-year ETR trends: MI, MD, and FL, where the intra-year trends are defined for firm-years. The number of repeated behaviors (under the heading “No.”) is the maximum number of years the same firm falls into a given intra-year ETR trend during my sample period of 1993-2012. The frequency distribution (under the heading “*N*”) is the number of firms exhibiting the corresponding maximum number of repeated behaviors in my sample. The number of repeated behaviors times the frequency distribution adds up to the total firm-years under each trend presented in Panel B.

Panel D presents descriptive statistics for the *ETRMiss* metric by intra-year ETR trend: MI, MD, and FL, where the intra-year trends are defined for firm-years.

Table 2 (continued)

Panel E presents tests in difference for the *ETRMiss* metric between the three intra-year ETR trends: MI, MD, and FL, where the intra-year trends are defined for firm-years. The first two rows present results for difference in means; the next two rows present results for difference in medians.

Panel F presents the persistence of ETR Miss. The first two columns show the persistence on one-year-back ETR Miss, for which the sample period is 1994-2012; the next two columns show the persistence on both one-year-back and two-years-back ETR Miss, for which the sample period is 1995-2012. The estimation is conducted using pooled OLS regression with standard errors clustered at the firm level. *t*-statistics is shown in parentheses. Full variable definitions are provided in Appendix A.

Table 3
Descriptive Statistics for Determinants of ETR Miss

Panel A. Reconciliation of Sample Selection					
Firm-years in the main sample					61,557
Less firm-years lacking data on:					
Internal control weakness (<i>ICW</i>) or auditor provided tax service (<i>ATS</i>)					34,878
Tax Aggressiveness (<i>TaxAgg</i>)					3,553
Financial Reporting Aggressiveness (<i>FinAgg</i>)					2,973
Institutional holding (<i>Gov</i>)					3,044
Other Regression Variables					4
Final Sample for Testing Determinants of ETR Miss (2002-2012)					17,105
Panel B. Descriptive Statistics (N = 17,105)					
Variable	Mean	Std. Dev.	25%	Median	75%
Outcome Variable					
<i>ETRMiss</i>	0.42	1.22	0.02	0.07	0.24
Test Variables					
<i>VolPD</i>	3.37	8.06	0.62	1.23	2.48
<i>TLoss</i>	0.40	0.49	0	0	1
<i>RDCR</i>	0.40	0.49	0	0	1
<i>Foreign</i>	0.21	0.36	0.00	0.00	0.31
<i>TaxAgg</i>	0.23	0.29	0.10	0.24	0.34
<i>FinAgg</i>	0.72	1.69	0.03	0.11	0.46
<i>Gov</i>	64.40	28.69	43.83	71.44	88.22
<i>ATS</i>	0.74	0.44	0	1	1
<i>ICW</i>	0.02	0.14	0	0	0
<i>RES</i>	0.07	0.26	0	0	0
Control Variable					
<i>lnMVE</i>	6.73	1.88	5.49	6.74	7.97

Table 3 (continued)

Panel C. Correlations ($N = 17,105$)

	<i>ETRMiss</i>	<i>VolPD</i>	<i>TLoss</i>	<i>RDCR</i>	<i>Foreign</i>	<i>TaxAgg</i>	<i>FinAgg</i>	<i>Gov</i>	<i>ATS</i>	<i>ICW</i>	<i>RES</i>	<i>lnMVE</i>
<i>ETRMiss</i>	1	0.15***	0.13***	0.19***	0.24***	-0.18***	0.10***	-0.08***	0.02**	0.09***	0.05***	-0.10***
<i>VolPD</i>	0.03***	1	0.10***	-0.00	-0.02***	-0.09***	0.06***	-0.03***	-0.01	0.04***	0.03***	-0.17***
<i>TLoss</i>	0.08***	0.04***	1	0.15***	0.23***	-0.10***	0.09***	0.13***	0.06***	0.03***	0.01*	0.05***
<i>RDCR</i>	0.09***	-0.01*	0.15***	1	0.41***	-0.03***	0.31***	0.08***	0.10***	0.04***	-0.02**	0.03***
<i>Foreign</i>	0.16***	-0.02**	0.17***	0.30***	1	0.05***	0.20***	0.24***	0.20***	0.05***	-0.02**	0.27***
<i>TaxAgg</i>	-0.09***	-0.01	-0.06***	-0.00	0.03***	1	-0.04***	0.03***	0.03***	-0.01	-0.02**	0.03***
<i>FinAgg</i>	0.04***	0.02**	0.05***	0.18***	0.09***	-0.01	1	-0.04***	0.03***	0.03***	0.00	-0.08***
<i>Gov</i>	-0.05***	-0.02**	0.13***	0.08***	0.15***	0.04***	-0.03***	1	0.14***	-0.00	-0.01*	0.50***
<i>ATS</i>	-0.01	0.01	0.06***	0.10***	0.14***	0.02***	0.03***	0.16***	1	0.00	-0.01	0.23***
<i>ICW</i>	0.07***	0.00	0.03***	0.04***	0.06***	0.00	0.02**	-0.01	0.00	1	0.17***	-0.03***
<i>RES</i>	0.05***	0.01	0.01*	-0.02**	0.01	-0.01	0.00	-0.02**	-0.01	0.17***	1	-0.04***
<i>lnMVE</i>	-0.08***	-0.05***	0.05***	0.04***	0.17***	0.04***	-0.00	0.56***	0.23***	-0.03***	-0.04***	1

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This table presents descriptive statistics for determinants of ETR Miss.

Panel A reconciles the main sample (with data available for the *ETRMiss* metric: 61,557 firm-year observations over 1993-2012) to the sample for testing determinants of ETR Miss (17,105 firm-year observations over 2002-2012). The main reason for the reduction in sample size is due to data limitations on internal control weakness (*ICW*) and auditor provided tax service (*ATS*), which are available in Audit Analytics from 2002 and 2000, respectively.

Panel B presents descriptive statistics for variables used for testing determinants of ETR Miss ($N = 17,105$) over 2002-2012. Full variable definitions are provided in Appendix A.

Panel C presents the Pearson (Spearman) correlations for the sample of 17,105 firm-year observations for testing determinants of ETR Miss below (above) the diagonal. *, **, *** correspond to significance levels at 0.1, 0.05, and 0.01, respectively, based on two-tailed tests.

Table 4
Regression Results: Determinants of ETR Miss

Variable	Panel A. 2002-2012		Panel B. 1993-2012	
	Coeff.	t-stat.	Coeff.	t-stat.
Intercept	0.732***	(11.34)	0.578***	(15.15)
<i>VolPD</i>	0.003**	(2.36)	0.003***	(3.60)
<i>TLoss</i>	0.112***	(4.93)	0.134***	(8.28)
<i>RDCR</i>	0.067**	(2.21)	0.056***	(3.14)
<i>Foreign</i>	0.520***	(11.25)	0.451***	(13.69)
<i>TaxAgg</i>	0.356***	(7.18)	0.290***	(9.79)
<i>FinAgg</i>	0.007	(1.02)	0.012**	(2.13)
<i>Gov</i>	-0.001**	(-2.46)	-0.001***	(-4.76)
<i>ATS</i>	-0.018	(-0.75)		
<i>ICW</i>	0.368***	(3.35)		
<i>RES</i>	0.165***	(3.67)	0.166***	(4.20)
<i>lnMVE</i>	-0.058***	(-8.17)	-0.051***	(-11.41)
Fixed Effects	Industry, Year		Industry, Year	
Adjusted- R^2	6%		5%	
<i>N</i>	17,105		36,815	

This table presents results testing the determinants of ETR Miss. Panel A shows results for the full model, where the sample period is 2002-2012, because data on internal control weakness (*ICW*) is available in Audit Analytics from 2002. Panel B shows results for the abbreviated model, where the sample period is 1993-2012, as variables for internal control weakness (*ICW*) and auditor-provided tax services (*ATS*, available in Audit Analytics from 2000) are removed from the model.

Presented results on tax aggressiveness (*TaxAgg*) are the estimated results multiplied by negative one, because the proxy for tax aggressiveness in this table is cash effective tax rate (*CashETR3YR*), with higher value indicating lower tax aggressiveness; while the interpretation is for higher tax aggressiveness and ETR Miss. Results on all other variables are as estimated.

The estimation is conducted using pooled OLS regression, with standard errors clustered at the firm level. *t*-statistics is shown in parentheses. Industry and year fixed effects (untabulated) are included in all estimations. Industry is defined using the Fama and French (1997) 12 Industry Classification. Full variable definitions are provided in Appendix A.

Table 5
Descriptive Statistics for ETR Miss and Earnings Persistence

Panel A. Reconciliation of Sample Selection					
Firm-years in the main sample					61,557
Less firm-years lacking data on:					
One year ahead pre-tax earnings ($PTBI_{t+1}$)					3,930
Pre-tax cash flows ($PTCF_t$)					336
Final Sample for Testing Slack and Earnings Persistence (1993-2012)					57,291
Panel B. Descriptive Statistics ($N = 57,291$)					
Variable	Mean	Std. Dev.	25%	Median	75%
Outcome Variable					
$PTBI_{t+1}$	0.07	0.11	0.02	0.06	0.13
Test Variables					
$ETRMiss_t$	0.33	1.04	0.02	0.05	0.17
$PTBI_t$	0.10	0.09	0.03	0.07	0.14
$PTCF_t$	0.12	0.11	0.03	0.10	0.18
$PTACC_t$	-0.02	0.08	-0.06	-0.02	0.02
Panel C. Correlations ($N = 57,291$)					
	$PTBI_{t+1}$	$ETRMiss_t$	$PTBI_t$	$PTCF_t$	$PTACC_t$
$PTBI_{t+1}$	1	-0.18***	0.68***	0.59***	-0.16***
$ETRMiss_t$	-0.09***	1	-0.21***	-0.13***	-0.06***
$PTBI_t$	0.61***	-0.09***	1	0.72***	-0.05***
$PTCF_t$	0.55***	-0.07***	0.72***	1	-0.65***
$PTACC_t$	-0.08***	-0.01**	0.12***	-0.59***	1

This table presents descriptive statistics for the consequence of ETR Miss on earnings persistence.

Panel A reconciles the main sample (with data available for the $ETRMiss$ metric: 61,557 firm-year observations over 1993-2012) to the sample for testing the consequence of ETR Miss on earnings persistence and the persistence of earnings components (57,291 firm-year observations over 1993-2012).

Panel B presents descriptive statistics for variables used for testing the consequence of ETR Miss on earnings persistence. Full variable definitions are provided in Appendix A.

Table 5 (continued)

Panel C presents the Pearson (Spearman) correlations for variables used for testing the consequence of ETR Miss on earnings persistence below (above) the diagonal. *, **, *** correspond to significance levels at 0.1, 0.05, and 0.01, respectively, based on two-tailed tests.

Table 6
Regression Results: ETR Miss and Earnings Persistence

Variable	Panel A. Earnings Persistence		Panel B. Persistence of Earnings Components	
	(1)	(2)	(3)	(4)
Intercept	0.004*** (5.67)	0.003*** (4.96)	-0.002*** (-3.85)	-0.002*** (-3.28)
$PTBI_t$	0.717*** (90.04)	0.733*** (93.63)		
$ETRMiss_t$		0.002*** (3.33)		0.000 (0.32)
$ETRMiss_t * PTBI_t$		-0.078*** (-7.51)		
$PTCF_t$			0.737*** (99.57)	0.746*** (101.03)
$PTACC_t$			0.519*** (48.73)	0.536*** (48.79)
$ETRMiss_t * PTCF_t$				-0.053*** (-5.39)
$ETRMiss_t * PTACC_t$				-0.059*** (-5.50)
Adjusted- R^2	37%	37%	39%	40%
N	57,291	57,291	57,291	57,291

This table presents results testing the consequence of ETR Miss on earnings persistence. The sample period is 1993-2012.

Panel A shows results for earnings persistence; Panel B shows results for the persistence of earnings components (i.e., the cash flows components and the accruals component). Columns (1) and (3) replicate the earnings persistence estimation used in prior studies; Columns (2) and (4) incorporate ETR Miss into the estimation for testing the consequence of ETR Miss on earnings persistence and the persistence of earnings components.

The estimation is conducted using pooled OLS regression, with standard errors clustered at the firm level. t -statistics is shown in parentheses. Full variable definitions are provided in Appendix A.

Table 7
Descriptive Statistics for ETR Miss and Value Relevance

Panel A. Reconciliation of Sample Selection					
Firm-years in the main sample					61,557
Less firm-years lacking data on:					
Three month ahead stock price (<i>P</i>)					505
Earnings per share (<i>E</i>)					72
Book value per share (<i>BV</i>)					151
Final Sample for Testing ETR Miss and Value Relevance (1993-2012)					60,829
Panel B. Descriptive Statistics (<i>N</i> = 60,829)					
Variable	Mean	Std. Dev.	25%	Median	75%
Outcome Variable					
<i>P</i>	23.46	20.86	9.74	19.00	32.51
Test Variables					
<i>ETRMiss</i>	0.32	1.03	0.02	0.05	0.17
<i>E</i>	1.44	1.36	0.51	1.09	1.90
<i>BV</i>	11.53	9.15	5.14	9.35	15.34
Panel C. Correlations (<i>N</i> = 60,829)					
	<i>P</i>	<i>ETRMiss</i>	<i>E</i>	<i>BV</i>	
<i>P</i>	1	-0.19***	0.70***	0.56***	
<i>ETRMiss</i>	-0.08***	1	-0.29***	-0.14***	
<i>E</i>	0.69***	-0.11***	1	0.68***	
<i>BV</i>	0.55***	-0.07***	0.71***	1	

This table presents descriptive statistics for the consequence of ETR Miss on value relevance.

Panel A reconciles the main sample (with data available for the *ETRMiss* metric: 61,557 firm-year observations over 1993-2012) to the sample for testing the consequence of ETR Miss on the value relevance of accounting information (60,829 firm-year observations over 1993-2012).

Panel B presents descriptive statistics for variables used for testing the consequence of ETR Miss on the value relevance of accounting information (*N* = 60,829) over 1993-2012. Full variable definitions are provided in Appendix A.

Table 7 (continued)

Panel C presents the Pearson (Spearman) correlations for variables used for testing the consequence of ETR Miss on the value relevance of accounting information below (above) the diagonal. *, **, *** correspond to significance levels at 0.1, 0.05, and 0.01, respectively, based on two-tailed tests.

Table 8
Regression Results: ETR Miss and Value Relevance

Variable	Panel A. Scaled Valuation Model		Panel B. Unscaled Valuation Model	
	(1)	(2)	(3)	(4)
Intercept	4.355*** (6.94)	4.555*** (7.35)	13.075 (0.09)	9.856 (0.07)
<i>E</i>	8.993*** (50.11)	9.464*** (51.24)	11.939*** (24.48)	12.539*** (24.83)
<i>BV</i>	0.405*** (15.63)	0.334*** (12.44)	0.802*** (9.83)	0.705*** (8.27)
<i>ETRMiss</i>		-0.631*** (-6.84)		-26.536** (-2.27)
<i>ETRMiss * E</i>		-1.168*** (-13.41)		-1.212*** (-5.34)
<i>ETRMiss * BV</i>		0.148*** (13.19)		0.168*** (4.64)
Fixed Effects	Industry, Year		Industry, Year	
Adjusted- <i>R</i> ²	53%	53%	86%	86%
<i>N</i>	60,829	60,829	61,042	61,042

This table presents results testing the consequence of ETR Miss on the value relevance of accounting information. The sample period is 1993-2012.

Panel A shows results for the scaled valuation model (where stock price, earnings, and book value are scaled by number of shares outstanding; that is, price per share, earnings per share, and book value per share are used); Panel B shows results for the unscaled valuation model (where total market value of equity, total earnings, and total book values are used). Columns (1) and (3) replicate the value relevance estimation used in prior studies; Columns (2) and (4) incorporate ETR Miss into the estimation for testing the consequence of ETR Miss on the value relevance of accounting information.

The estimation is conducted using pooled OLS regression, with standard errors clustered at the firm level. *t*-statistics is shown in parentheses. Industry and year fixed effects (untabulated) are included in all estimations. Industry is defined using the Fama and French (1997) 12 Industry Classification. Full variable definitions are provided in Appendix A.

Table 9
Quarterly Analysis

Panel A. ETR Miss and the Persistence of Quarterly Earnings

Variable	Earnings Persistence		Persistence of Earnings Components	
	(1)	(2)	(3)	(4)
Intercept	0.002*** (15.70)	0.003*** (17.24)	0.003*** (17.01)	0.003*** (19.01)
$PTBI_t$	0.636*** (82.38)	0.653*** (85.64)		
$ETRMiss_t$		-0.000*** (-4.45)		-0.000*** (-5.38)
$ETRMiss_t * PTBI_t$		-0.060*** (-11.95)		
$PTCF_t$			0.617*** (79.70)	0.632*** (82.62)
$PTACC_t$			0.535*** (66.60)	0.554*** (69.73)
$ETRMiss_t * PTCF_t$				-0.055*** (-11.37)
$ETRMiss_t * PTACC_t$				-0.055*** (-11.46)
Adjusted- R^2	29%	29%	27%	28%
N	204,311	204,311	204,311	204,311

Table 9 (continued)

Panel B. ETR Miss and the Value Relevance of Quarterly Earnings				
Variable	Scaled Valuation Model		Unscaled Valuation Model	
	(1)	(2)	(3)	(4)
Intercept	4.790*** (4.64)	5.165*** (5.01)	124.272 (0.63)	127.025 (0.65)
<i>E</i>	22.202*** (39.99)	22.948*** (39.66)	35.968*** (22.27)	37.573*** (22.48)
<i>BV</i>	0.714*** (28.89)	0.681*** (26.74)	1.170*** (15.53)	1.106*** (14.27)
<i>ETRMiss</i>		-0.787*** (-12.41)		-50.286*** (-5.14)
<i>ETRMiss * E</i>		-2.090*** (-13.84)		-3.225*** (-8.48)
<i>ETRMiss * BV</i>		0.051*** (7.56)		0.095*** (4.40)
Fixed Effects	Industry, Year, Quarter		Industry, Year, Quarter	
Adjusted- <i>R</i> ²	47%	47%	84%	84%
<i>N</i>	204,311	204,311	204,309	204,309

This table presents results testing the consequence of ETR Miss using quarterly data. The sample period is 1993-2012.

Panel A presents results testing the consequence of ETR Miss on the persistence of quarterly earnings. Columns (1) and (2) show results for earnings persistence. Columns (3) and (4) show results for the persistence of earnings components (i.e., the cash flows component and the accruals component). The estimation is conducted using pooled OLS regression, with standard errors clustered at the firm level. *t*-statistics is shown in parentheses. Full variable definitions are provided in Appendix A.

Panel B presents results testing the consequence of ETR Miss on the value relevance of quarterly earnings. Columns (1) and (2) show results for the scaled valuation model (where stock price, earnings, and book value are scaled by number of shares outstanding; that is, price per share, earnings per share, and book value per share are used). Columns (3) and (4) show results for the unscaled valuation model (where total market value of equity, total earnings, and total book values are used). The estimation is conducted using pooled OLS regression, with standard errors clustered at the firm level. *t*-statistics is shown in parentheses. Industry, year and quarter fixed effects (untabulated) are included in all estimations. Industry is defined using the Fama and French (1997) 12 Industry Classification. Full variable definitions are provided in Appendix A.

Table 10
Robustness Check for Determinants of ETR Miss

Panel A. Alternative Measures of Regression Variables

Variable	Outcome Variable		Explanatory Variables			
	<i>Miss_Q4</i>	<i>Miss_CV</i>	<i>GAAPETR3YR</i>	<i>UTB</i>	<i>Abs_PMDAC</i>	<i>ICW_Gen</i>
	(1)	(2)	(3)	(4)	(5)	(6)
Intercept	0.906***	0.567***	0.924***	0.899***	0.732***	0.727***
<i>VolPD</i>	0.003**	0.002***	0.003***	0.003	0.003**	0.003**
<i>TLoss</i>	0.114***	0.062***	0.103***	0.137***	0.112***	0.113***
<i>RDCR</i>	0.071**	0.031**	0.050*	0.006	0.067**	0.069**
<i>Foreign</i>	0.533***	0.278***	0.465***	0.560***	0.520***	0.524***
<i>TaxAgg</i>	0.358***	0.209***	0.871***	7.778***	0.356***	0.356***
<i>FinAgg</i>	0.006	0.002	0.014**	0.006	0.007	0.007
<i>Gov</i>	-0.001**	-0.001***	-0.001**	-0.002**	-0.001**	-0.001**
<i>ATS</i>	-0.012	-0.010	-0.022	-0.001	-0.018	-0.017
<i>ICW</i>	0.382***	0.125***	0.261**	0.423**	0.368***	0.163***
<i>RES</i>	0.161***	0.081***	0.157***	0.125	0.165***	0.159***
<i>lnMVE</i>	-0.060***	-0.032***	-0.058***	-0.091***	-0.058***	-0.057***
Fixed Effects	Industry, Year		Industry, Year			
Adjusted-R ²	6%	7%	8%	7%	6%	6%
<i>N</i>	17,100	17,080	18,007	6,567	17,105	17,105

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Table 10 (continued)

Panel B. Sample Exclusion

Variable	Full Model: 2002-2012				Abbreviated Model: 1993-2012			
	Regression Results after Sample Exclusion for:				Regression Results after Sample Exclusion for:			
	Special Items Annual	Special Items Quarterly	Financial and Utilities	Different Q4 and Year-end Annual ETR	Special Items Annual	Special Items Quarterly	Financial and Utilities	Different Q4 and Year-end Annual ETR
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Intercept	0.798***	0.766***	0.772***	0.737***	0.513***	0.482***	0.602***	0.624***
<i>VolPD</i>	0.003	0.004*	0.004**	0.003**	0.003**	0.003***	0.003***	0.003***
<i>TLoss</i>	0.129***	0.140***	0.122***	0.111***	0.145***	0.152***	0.138***	0.130***
<i>RDCR</i>	0.087**	0.097**	0.077**	0.076**	0.040**	0.065***	0.060***	0.062***
<i>Foreign</i>	0.341***	0.440***	0.545***	0.533***	0.321***	0.356***	0.464***	0.473***
<i>TaxAgg</i>	0.260***	0.290***	0.381***	0.346***	0.225***	0.213***	0.312***	0.299***
<i>FinAgg</i>	0.014	0.007	0.007	0.005	0.015*	0.011	0.012**	0.010*
<i>Gov</i>	-0.002***	-0.002***	-0.001**	-0.001**	-0.002***	-0.002***	-0.002***	-0.001***
<i>ATS</i>	0.015	-0.003	-0.031	-0.009				
<i>ICW</i>	0.267*	0.311**	0.392***	0.383***				
<i>RES</i>	0.020	0.024	0.183***	0.180***	0.026	0.043	0.185***	0.182***
<i>lnMVE</i>	-0.054***	-0.052***	-0.065***	-0.062***	-0.047***	-0.043***	-0.055***	-0.056***
Fixed Effects	Industry, Year				Industry, Year			
Adjusted-R ²	5%	6%	6%	6%	5%	4%	6%	5%
<i>N</i>	6,603	6,752	14,198	15,123	18,522	19,468	30,942	29,350

Table 10 (continued)

This table presents robustness check for testing determinants of ETR Miss.

Panel A shows results using alternative measures of regression variables. The sample period is 2002-2012. Columns (1) and (2) present results using alternative measures of outcome variable: Column (1) uses *Miss_Q4* (which uses Q4 year-to-date ETR from Compustat Quarterly to replace year-end annual ETR from Compustat Annual for computation of *ETRMiss* as defined in Appendix A), and Column (2) uses *Miss_CV* (which is the unadapted coefficient of variation of the four annual ETR estimates made during the year). Columns (3) to (6) present results using alternative measures of explanatory variables: Column (3) uses *GAAPETR3YR* as an alternative measure for *TaxAgg*; Column (4) uses *UTB* as an alternative measure for *TaxAgg*; Column (5) uses *Abs_PMDAC* as an alternative measure for *FinAgg*; and Column (6) uses *ICW_Gen* as an alternative measure for *ICW*.

Panel B shows results after alternative sample exclusions. The first four columns show results from the full model, where the sample period is 2002-2012, because data on internal control weakness (*ICW*) is available in Audit Analytics from 2002. The next four columns show results from the abbreviated model, where the sample period is 1993-2012, as variables for internal control weakness (*ICW*) and auditor-provided tax services (*ATS*, available in Audit Analytics from 2000) are removed from the model. Columns (1) and (5) present results after sample exclusion for special items from Compustat Annual (Compustat data item *SPI*); Columns (2) and (6) present results after sample exclusion for special items from Compustat Quarterly (Compustat data item *SPIQ*); Columns (3) and (7) present results after sample exclusion for all financial (SIC 6000-6999) and utility (SIC 4900-4999) firms; and Columns (4) and (8) present results after sample exclusion for firm-years with different Q4 year-to-date ETR (from Compustat Quarterly) and year-end annual ETR (from Compustat Annual).

For both Panel A and Panel B, except for the *UTB* measure (in Column 4 of Panel A), all presented results on tax aggressiveness (*TaxAgg*) are the estimated results multiplied by negative one, because the proxy for tax aggressiveness in the main specification is cash effective tax rate (*CashETR3YR*, used in Columns 1, 2, 5 and 6 of Panel A, and all Columns of Panel B), with higher value indicating lower tax aggressiveness; while the interpretation is for higher tax aggressiveness and ETR Miss. Similarly, the alternative measure using GAAP effective tax rate (*GAAPETR3YR*, in Column 3 of Panel A) has a similar interpretation, and its presented result is also the estimated result multiplied by negative one. Result on *UTB* is as estimated, because higher value of *UTB* indicates higher tax aggressiveness. Results on all other variables are as estimated.

Table 10 (continued)

The estimation is conducted using pooled OLS regression, with standard errors clustered at the firm level. *, **, *** correspond to significance levels at 0.1, 0.05, and 0.01, respectively. Industry and year fixed effects (untabulated) are included in all estimations. Industry is defined using the Fama and French (1997) 12 Industry Classification. Full variable definitions are provided in Appendix A.

Table 11
Robustness Check for ETR Miss and Earnings Persistence

Panel A. Alternative Measures of Regression Variables

Variable	Earnings Persistence			Persistence of Earnings Components		
	<i>Miss_Q4</i>	<i>Miss_CV</i>	<i>OI</i>	<i>Miss_Q4</i>	<i>Miss_CV</i>	<i>OI</i>
	(1)	(2)	(3)	(4)	(5)	(6)
Intercept	0.003***	0.003***	0.007***	-0.002***	-0.002***	0.008***
<i>PTBI_t</i>	0.728***	0.743***	0.800***			
<i>ETRMiss_t</i>	0.002***	0.006***	0.001***	0.001	0.000	0.001**
<i>ETRMiss_t * PTBI_t</i>	-0.075***	-0.200***	-0.036***			
<i>PTCF_t</i>				0.739***	0.747***	0.779***
<i>PTACC_t</i>				0.525***	0.550***	0.675***
<i>ETRMiss_t * PTCF_t</i>				-0.052***	-0.127***	-0.037***
<i>ETRMiss_t * PTACC_t</i>				-0.053***	-0.165***	-0.028***
Adjusted- <i>R</i> ²	37%	38%	55%	39%	40%	55%
<i>N</i>	50,633	50,604	57,286	50,633	50,604	57,286

Table 11 (continued)

Panel B. Sample Exclusion

Variable	Earnings Persistence				Persistence of Earnings Components			
	Regression Results after Sample Exclusion for:				Regression Results after Sample Exclusion for:			
	Special Items Annual	Special Items Quarterly	Financial and Utilities	Different Q4 and Year-end Annual ETR	Special Items Annual	Special Items Quarterly	Financial and Utilities	Different Q4 and Year-end Annual ETR
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Intercept	0.001	0.002**	0.003***	0.003***	-0.001*	-0.001	-0.008***	-0.002***
$PTBI_t$	0.760***	0.758***	0.732***	0.730***				
$ETRMiss_t$	0.000	0.001	0.002**	0.003***	-0.001	-0.001	0.001	0.001
$ETRMiss_t * PTBI_t$	-0.059***	-0.044***	-0.073***	-0.079***				
$PTCF_t$					0.758***	0.759***	0.773***	0.741***
$PTACC_t$					0.571***	0.567***	0.545***	0.529***
$ETRMiss_t * PTCF_t$					-0.043***	-0.030***	-0.052***	-0.054***
$ETRMiss_t * PTACC_t$					-0.044***	-0.032**	-0.055***	-0.054***
Adjusted- R^2	44%	43%	31%	38%	44%	44%	34%	40%
N	32,008	33,270	41,029	45,569	32,008	33,270	41,029	45,569

Table 11 (continued)

This table presents robustness check for testing the consequence of ETR Miss on earnings persistence. The sample period is 1993-2012.

Panel A shows results using alternative measures of regression variables. The first three columns show results for earnings persistence; the next three columns show results for the persistence of earnings components. Columns (1) and (4) present results using *Miss_Q4* (which uses Q4 year-to-date ETR from Compustat Quarterly to replace year-end annual ETR from Compustat Annual for computation of *ETRMiss* as defined in Appendix A) as an alternative measure for *ETRMiss*; Columns (2) and (5) present results using *Miss_CV* (which is the unadapted coefficient of variation of the four annual ETR estimates made during the year) as an alternative measure for *ETRMiss*; and Columns (3) and (6) present results using operating income and operating accruals as alternative measures for pre-tax earnings and earnings components.

Panel B shows results after alternative sample exclusions. The first four columns show results for earnings persistence; the next four columns show results for the persistence of earnings components. Columns (1) and (5) present results after sample exclusion for special items from Compustat Annual (Compustat data item *SPI*); Columns (2) and (6) present results after sample exclusion for special items from Compustat Quarterly (Compustat data item *SPIQ*); Columns (3) and (7) present results after sample exclusion for all financial (SIC 6000-6999) and utility (SIC 4900-4999) firms; and Columns (4) and (8) present results after sample exclusion for firm-years with different Q4 year-to-date ETR (from Compustat Quarterly) and year-end annual ETR (from Compustat Annual).

The estimation is conducted using pooled OLS regression, with standard errors clustered at the firm level. *, **, *** correspond to significance levels at 0.1, 0.05, and 0.01, respectively. Full variable definitions are provided in Appendix A.

Table 12
Robustness Check for ETR Miss and Value Relevance

Panel A. Alternative Measures of Regression Variables				
Variable	<i>Miss_Q4</i>		<i>Miss_CV</i>	
	Coeff.	t-stat.	Coeff.	t-stat.
		(1)		(2)
Intercept	3.268***	(3.53)	3.409***	(3.67)
<i>E</i>	9.503***	(50.01)	9.706***	(50.63)
<i>BV</i>	0.339***	(12.51)	0.314***	(11.49)
<i>ETRMiss</i>	-0.612***	(-6.76)	-1.116***	(-5.93)
<i>ETRMiss * E</i>	-1.139***	(-13.68)	-2.985***	(-13.96)
<i>ETRMiss * BV</i>	0.142***	(13.24)	0.338***	(12.63)
Fixed Effects	Industry, Year			
Adjusted- <i>R</i> ²	54%		54%	
<i>N</i>	53,851		53,825	

Panel B. Sample Exclusion				
Regression Results after Sample Exclusion for:				
Variable	Special Items	Special Items	Financial and	Different Q4 and
	Annual	Quarterly	Utilities	Year-end
	(1)	(2)	(3)	(4)
Intercept	3.481***	4.013***	4.259***	2.936***
<i>E</i>	10.563***	10.365***	9.377***	9.682***
<i>BV</i>	0.153***	0.183***	0.414***	0.314***
<i>ETRMiss</i>	-0.850***	-0.703***	-0.553***	-0.653***
<i>ETRMiss * E</i>	-1.382***	-1.409***	-1.140***	-1.204***
<i>ETRMiss * BV</i>	0.168***	0.179***	0.140***	0.155***
Fixed Effects	Industry, Year			
Adjusted- <i>R</i> ²	53%	52%	54%	54%
<i>N</i>	34,058	35,373	43,208	48,732

Table 12 (continued)

Panel C. Two-Stage Estimation: Discretionary ETR Miss

Variable	Coeff.	t-stat.
Intercept	-1.188	(-1.09)
<i>E</i>	8.651***	(34.91)
<i>BV</i>	0.464***	(12.98)
<i>ETRMiss</i>	-0.183	(-1.50)
<i>ETRMiss * E</i>	-0.886***	(-6.23)
<i>ETRMiss * BV</i>	0.112***	(7.11)
Fixed Effects	Industry, Year	
Adjusted- R^2	61%	
<i>N</i>	16,966	

This table presents robustness check for testing the consequence of ETR Miss on value relevance, using the scaled valuation model. The sample period is 1993-2012.

Panel A shows results using alternative measures of regression variables. Column (1) presents results using *Miss_Q4* (which uses Q4 year-to-date ETR from Compustat Quarterly to replace year-end annual ETR from Compustat Annual for computation of *ETRMiss* as defined in Appendix A) as an alternative measure for *ETRMiss*; Column (2) presents results using *Miss_CV* (which is the unadapted coefficient of variation of the four annual ETR estimates made during the year) as an alternative measure for *ETRMiss*.

Panel B shows results after alternative sample exclusions. Column (1) presents results after sample exclusion for special items from Compustat Annual (Compustat data item *SPI*); Column (2) presents results after sample exclusion for special items from Compustat Quarterly (Compustat data item *SPIQ*); Column (3) presents results after sample exclusion for all financial (SIC 6000-6999) and utility (SIC 4900-4999) firms; and Column (4) presents results after sample exclusion for firm-years with different Q4 year-to-date ETR (from Compustat Quarterly) and year-end annual ETR (from Compustat Annual).

Panel C shows results from two-stage estimation, where discretionary ETR Miss is tested in the second stage instead of total ETR Miss. Discretionary ETR Miss is estimated as the residual value from the first stage model, where ETR Miss is modeled as a function of its determinants specified in Equation (1).

The estimation is conducted using pooled OLS regression, with standard errors clustered at the firm level. *t*-statistics is shown in parentheses. *, **, *** correspond to significance levels at 0.1, 0.05, and 0.01, respectively. Industry and year fixed effects (untabulated) are included in all estimations. Industry is defined using the Fama and French (1997) 12 Industry Classification. Full variable definitions are provided in Appendix A.

Table 13
Robustness Check Using Alternative Sample Period

Panel A. Alternative Sample Period for Testing Determinants of ETR Miss				
Variable	1993-2002		2003-2012	
	Coeff.	t-stat.	Coeff.	t-stat.
	(1)		(2)	
Intercept	0.510***	(12.03)	0.903***	(13.15)
<i>VolPD</i>	0.003***	(3.17)	0.002*	(1.96)
<i>TLoss</i>	0.159***	(7.15)	0.106***	(4.71)
<i>RDCR</i>	0.047**	(2.40)	0.067**	(2.24)
<i>Foreign</i>	0.283***	(7.09)	0.557***	(11.74)
<i>TaxAgg</i>	0.221***	(6.72)	0.371***	(7.23)
<i>FinAgg</i>	0.017*	(1.67)	0.008	(1.12)
<i>Gov</i>	-0.002***	(-5.47)	-0.001**	(-2.20)
<i>RES</i>	0.015	(0.29)	0.199***	(4.17)
<i>lnMVE</i>	-0.037***	(-7.16)	-0.065***	(-9.57)
Fixed Effects	Industry, Year			
Adjusted- <i>R</i> ²	3%		6%	
<i>N</i>	20,204		16,611	

Panel B. Alternative Sample Period for Testing ETR Miss and Earnings Persistence				
Variable	Earnings Persistence		Persistence of Earnings Components	
	1993-2002	2003-2012	1993-2002	2003-2012
	(1)	(2)	(3)	(4)
Intercept	0.003***	0.003***	-0.002**	-0.002**
<i>PTBI_t</i>	0.705***	0.773***		
<i>ETRMiss_t</i>	0.000	0.003***	-0.002	0.002**
<i>ETRMiss_t * PTBI_t</i>	-0.060***	-0.096***		
<i>PTCF_t</i>			0.725***	0.776***
<i>PTACC_t</i>			0.511***	0.587***
<i>ETRMiss_t * PTCF_t</i>			-0.034**	-0.073***
<i>ETRMiss_t * PTACC_t</i>			-0.047***	-0.075***
Adjusted- <i>R</i> ²	34%	44%	36%	45%
<i>N</i>	32,665	24,626	32,665	24,626

Table 13 (continued)

Panel C. Alternative Sample Period for Testing ETR Miss and Value Relevance				
Variable	1993-2002		2003-2012	
	Coeff.	t-stat.	Coeff.	t-stat.
	(1)		(2)	
Intercept	4.533***	(6.69)	8.101***	(9.55)
<i>E</i>	9.611***	(37.34)	9.301***	(42.69)
<i>BV</i>	0.269***	(7.07)	0.391***	(12.57)
<i>ETRMiss</i>	-0.482***	(-2.83)	-0.653***	(-6.09)
<i>ETRMiss * E</i>	-1.350***	(-7.47)	-1.094***	(-11.82)
<i>ETRMiss * BV</i>	0.161***	(7.53)	0.138***	(11.49)
Fixed Effects	Industry, Year			
Adjusted- <i>R</i> ²	44%		61%	
<i>N</i>	35,084		25,745	

This table presents robustness check using alternative sample period, where separate tests are conducted for the first half of the sample period (1993-2002) and the second half of the sample period (2003-2012).

Panel A shows results using alternative sample period for testing determinants of ETR Miss. To ensure comparability across the two sample periods, results are estimated with the abbreviated model, which removes two variables that are only available in the later part of the sample period: (i) internal control weakness (*ICW*, available from 2002); and (ii) auditor-provided tax services (*ATS*, available from 2000). Column (1) presents results for the sample period 1993-2002; Column (2) presents results for the sample period 2003-2012. Results on tax aggressiveness (*TaxAgg*) are the estimated results multiplied by negative one, because the proxy for tax aggressiveness in this table is cash effective tax rate (*CashETR3YR*), with higher value indicating lower tax aggressiveness; while the interpretation is for higher tax aggressiveness and ETR Miss. Results on all other variables are as estimated.

Panel B shows results using alternative sample period for testing ETR Miss and earnings persistence. The first two columns show results for earnings persistence; the next two columns show results for the persistence of earnings components. Columns (1) and (3) present results for the sample period 1993-2002; Columns (2) and (4) present results for the sample period 2003-2012.

Panel C shows results using alternative sample period for testing ETR Miss and value relevance, estimated with the scaled valuation model. Column (1) presents results for the sample period 1993-2002; Column (2) presents results for the sample period 2003-2012.

Table 13 (continued)

The estimation is conducted using pooled OLS regression, with standard errors clustered at the firm level. *t*-statistics is shown in parentheses. *, **, *** correspond to significance levels at 0.1, 0.05, and 0.01, respectively. Industry and year fixed effects (untabulated) are included for estimations in Panel A and Panel C. Industry is defined using the Fama and French (1997) 12 Industry Classification. Full variable definitions are provided in Appendix A.

Table 14
Robustness Check Using Alternative Sample Selection

Panel A. Alternative Sample Selection for Testing Determinants of ETR Miss				
Variable	2002-2012		1993-2012	
	Coeff.	t-stat.	Coeff.	t-stat.
	(1)		(2)	
Intercept	0.301***	(13.90)	0.301***	(10.70)
<i>VolPD</i>	0.001***	(2.83)	0.001***	(4.60)
<i>TLoss</i>	0.035***	(4.67)	0.046***	(7.87)
<i>RDCR</i>	0.042***	(4.55)	0.024***	(3.87)
<i>Foreign</i>	0.176***	(11.87)	0.164***	(14.71)
<i>TaxAgg</i>	0.138***	(7.82)	0.147***	(12.24)
<i>FinAgg</i>	0.003	(1.48)	0.005**	(2.44)
<i>Gov</i>	-0.001***	(-5.67)	-0.001***	(-8.39)
<i>ATS</i>	0.010	(1.32)		
<i>ICW</i>	0.110***	(3.36)		
<i>RES</i>	0.019	(1.41)	0.027**	(2.41)
<i>lnMVE</i>	-0.017***	(-6.42)	-0.018***	(-9.89)
Fixed Effects	Industry, Year		Industry, Year	
Adjusted- R^2	8%		8%	
<i>N</i>	14,996		28,966	

Panel B. Alternative Sample Selection for Testing ETR Miss and Earnings Persistence				
Variable	Earnings Persistence		Persistence of Earnings Components	
	Coeff.	t-stat.	Coeff.	t-stat.
	(1)		(2)	
Intercept	0.002***	(3.46)	-0.001	(-1.25)
<i>PTBI_t</i>	0.764***	(95.07)		
<i>ETRMiss_t</i>	0.003	(1.18)	-0.004	(-1.63)
<i>ETRMiss_t * PTBI_t</i>	-0.245***	(-7.95)		
<i>PTCF_t</i>			0.757***	(95.83)
<i>PTACC_t</i>			0.570***	(45.17)
<i>ETRMiss_t * PTCF_t</i>			-0.160***	(-5.76)
<i>ETRMiss_t * PTACC_t</i>			-0.142***	(-4.33)
Adjusted- R^2	43%		44%	
<i>N</i>	44,985		44,985	

Table 14 (continued)

Panel C. Alternative Sample Selection for Testing ETR Miss and Value Relevance

Variable	Scaled Valuation Model		Unscaled Valuation Model	
	Coeff.	t-stat.	Coeff.	t-stat.
	(1)		(2)	
Intercept	3.786***	(3.63)	-68.737	(-0.37)
<i>E</i>	10.212***	(48.33)	13.860***	(26.46)
<i>BV</i>	0.226***	(7.62)	0.444***	(4.71)
<i>ETRMiss</i>	-3.308***	(-9.23)	-182.585***	(-3.98)
<i>ETRMiss * E</i>	-3.897***	(-10.93)	-5.125***	(-4.92)
<i>ETRMiss * BV</i>	0.579***	(12.15)	0.912***	(5.40)
Fixed Effects	Industry, Year		Industry, Year	
Adjusted- <i>R</i> ²	55%		86%	
<i>N</i>	47,808		47,960	

This table presents robustness check using alternative sample selection criteria. In particular, data on annual ETR estimates are required for all three interim dates (i.e., Q1, Q2, and Q3) for a firm-year to be included in the sample. The sample period is 1993-2012.

Panel A shows results using alternative sample selection for testing determinants of ETR Miss. Column (1) presents results from the full model, where the sample period is 2002-2012, because data on internal control weakness (*ICW*) is available in Audit Analytics from 2002. Column (2) presents results from the abbreviated model, where the sample period is 1993-2012, as variables for internal control weakness (*ICW*) and auditor-provided tax services (*ATS*, available in Audit Analytics from 2000) are removed from the model. Results on tax aggressiveness (*TaxAgg*) are the estimated results multiplied by negative one, because the proxy for tax aggressiveness in this table is cash effective tax rate (*CashETR3YR*), with higher value indicating lower tax aggressiveness; while the interpretation is for higher tax aggressiveness and ETR Miss. Results on all other variables are as estimated.

Panel B shows results using alternative sample selection for testing ETR Miss and earnings persistence. Column (1) presents results for earnings persistence; Column (2) presents results for the persistence of earnings components.

Panel C shows results using alternative sample selection for testing ETR Miss and value relevance. Column (1) presents results for the scaled valuation model (where stock price, earnings, and book value are scaled by number of shares outstanding; that is, price per share, earnings per share, and book value per share are used); Column (2) presents results for the unscaled valuation model (where total market value of equity, total earnings, and total book values are used).

Table 14 (continued)

The estimation is conducted using pooled OLS regression, with standard errors clustered at the firm level. *t*-statistics is shown in parentheses. Industry and year fixed effects (untabulated) are included for estimations in Panel A and Panel C. Industry is defined using the Fama and French (1997) 12 Industry Classification. Full variable definitions are provided in Appendix A.

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