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Developing an Improved Measure of Earnings Management

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Abstract

Over the last 30 years, researchers have developed different approaches to measure earnings management. This study builds on prior research and combines the total accrual approach and the earnings distribution after management approach to develop a more accurate measure of earnings management. Empirical results show that this refined measure developed in this study is able to more precisely identify firms that manipulated earnings (manipulators) and firms that did not manipulate earnings (non-manipulators). This contributes to the earnings management literature a more accurate measure of earnings management to meet or beat a specific earnings benchmark. The results of this paper has practical implications. In particular, practitioners (financial analysts and investors) can use the new measure developed in this study to more accurately detect firms' earnings management activities. This enables practitioners to better interpret firms' financial statements and earnings news.

Keywords: earnings management, accounting manipulation, total accrual.

I. INTRODUCTION

Healy and Wahlen (1999) state that "earnings management occurs when managers use judgment in financial reporting and structuring transactions to alter financial reports to either mislead some stakeholders about the underlying economic performance of the company or to influence contractual outcomes that depend on reported accounting numbers." Firms are motivated to manipulate earnings upward to meet earnings benchmarks for the following reasons. First, there is a tendency for the stock market to punish firms for falling short of earnings expectations (see Skinner & Sloan, 2002). Second, several studies, such as Bowen et al. (1995) and Burgstahler and Dichev (1997), find that firms that meet earnings benchmarks tend to enhance their reputations with stakeholders, such as customers, suppliers, and creditors, and, as a result, enjoy better terms of trade. Furthermore, Healy (1985) claims that managers exercise accounting discretion in order to maximize the present values of their bonus compensations. In a related study, Matsunaga and Park (2001) find that failure to meet analyst forecasts results in pay cuts for CEOs. Overall, these results suggest that due to stock market pressure, the reputation effect, and private benefits for management, firm managers are motivated to manipulate earnings to meet or beat expectations (MBE).

It should be stressed that firms have a number of ways to manipulate earnings upward; for instance, they can use accounting discretion to [i] create income- increasing discretionary accruals (accrual manipulation) or [ii] take real economic steps, such as reducing discretionary spending on R&D, advertising, and maintenance, to boost earnings (real activity earnings management). Furthermore, there are multiple earnings benchmarks that firms attempt to achieve through earnings management. For instance, Burgstahler and Dichev (1997) show that firms manipulate earnings to avoid reporting losses and earnings decreases, and Degeorge et al. (1999) show that in addition to the positive earnings and positive earnings changes benchmarks, firms also manipulate

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earnings to meet or beat analyst expectations. It is therefore difficult (if not impossible) to use a single approach to capture all types of earnings management activities for all purposes. In this paper, I design a specific measure to capture one particular type of earnings management for one particular purpose, which is accrual management to avoid reporting negative earnings.

II. LITERATURE REVIEW

In the accounting literature, three approaches have been used to measure earnings management. These are: (i) the aggregate accrual approach (e.g. Jones, 1991); (ii) the specific accrual approach (e.g., McNichols & Wilson, 1988); and (iii) the distribution of earnings after manipulation approach (e.g. Degeorge et al., 1999). In the aggregate accrual approach, total accruals are regressed on selected nondiscretionary variables and the residual is taken as an estimate of discretionary accruals. This approach allows us to measure the magnitude of earnings management that arises from manipulation of all accrual accounts; however, the power of these aggregate models to find manipulation has been shown to be dismally low (e.g., Bernard & Skinner, 1996). The specific accrual approach focuses on specific industry or contextual settings where one or more accruals tend to be sizable. It detects earnings management through a particular accrual account, rather than identifying all manipulated accruals to measure the overall magnitude of earnings management arising from manipulation of all accounts. The distribution of earnings after management approach focuses on the behaviour of earnings around a specified benchmark and tests whether the instances of amounts above and below the benchmark are distributed smoothly or whether it simply reflects discontinuities due to the exercise of discretion. This is a powerful tool for identifying contexts in which large numbers of firms appear to manage earnings. However, it is silent on the magnitude of manipulation at an individual firm-year/quarter level. Furthermore, it uses an imprecise benchmark (i.e., whether earnings are slightly above earnings thresholds) to identify true manipulators.

In this study, I build on the aggregate accrual approach and the distribution of earnings after management approach to develop a measure of earnings management. I then test the ability of this measure to detect earnings management using the specific accrual approach. Specifically, to develop the measure I first use the aggregate accrual approach to compute discretionary accruals; I then use the distribution of earnings after management approach to identify firms that manipulate accruals to cross a specific earnings benchmark.

In the next section, I present the sample statistics and describe the procedure used to develop and test the earnings management measure.

III. RESEARCH METHODOLOGY

3.1. Methodology

The sample used in this study consists of all U.S. firms that have data on Compustat. Earlier studies, such as Bowen et al. (1995) and Matsumoto (2002), use the modified Jones models to estimate discretionary accruals to examine the impacts of earnings management on MBE. Dechow et al. (2003) propose a so-called forward-looking modified Jones (FLMJ) model and demonstrate that this model outperforms the Jones and modified Jones models in capturing discretionary accruals. I first implement the FLMJ model on the sample. I then compare the estimation of the FLMJ model with the estimations of other Jones-type models. The FLMJ model is specified as follows:

$$\textbf{Accrual}_{it} = \alpha + \beta_1((1+k)\Delta \textbf{Sales}_{i,t} - \Delta \textbf{AR}_{i,t}) + \beta_2 \textbf{GPPE}_{i,t} + \beta_3 \textbf{Accrual}_{it-1} + \beta_4 \textbf{GR\_Sales}_{i,t+1} + \varepsilon_{it} \quad (1)$$

Where:

$Accrual_{it}$ is firm i's total accruals from year t;

$(1+k)\Delta Sales_{i,t}-\Delta AR_{i,t}$ is an unexpected portion of the change in account receivable due to the change in sales;

$\Delta Sales_{i,t}$ is the change in firm i's sales revenue (Compustat data item #12) from year t-1 to t;

$\Delta AR_{i,t}$ is the change in firm i's accounts receivable from operating activities from year t-1 to t (Compustat data item #302);

$GPPE_{i,t}$ is firm i's year t gross property plant and equipment – land excluded (Compustat data item #7);

$GR\_Sales_{i,t+1}$ is the change in firm i's sales from year t to year t+1; and

ε_{it} is zero-mean random error term.

Hribar and Collins (2002) show that the balance-sheet method may produce substantial errors in accrual estimation. Therefore, I use the cash-flow statement approach to calculate $Accrual_{it}$ by subtracting its operating cash flows from its net income:

$$\textbf{A}_{it} = \textbf{EBEI}_{it} - (\textbf{CFO}_{it} - \textbf{EIDO}_{it}) \quad (2)$$

Where:

$EBEI_{it}$ is firm i's income before extraordinary items in year t (Compustat item #123);

CFO_{it} is firm i's cash flows from operations in year t (Compustat item #308); and

$EIDO_{it}$ is firm i's extraordinary items and discontinued operations from the statement of cash flows in year t (Compustat data item #124).

The coefficient k in (3.1) is estimated from the following regression:

$$\Delta \textbf{AR}_{it} = \textbf{a} + \textbf{k}\Delta \textbf{Sales}_{it} + \varepsilon_{it} \quad (3)$$

by ordinary least squares (OLS), where the slope coefficient (k) in (3) represents the expected changes in account receivables for a given one-unit change in sales, and ε_{it} is a zero-mean error term. Then I obtain an OLS estimate of the slope coefficient as $\hat{k}$. This estimate is then used to construct the unexpected portion of the change in account receivable due to the change in sales in (1) as $(1+\hat{k})\Delta Sales_{it}-\Delta AR_{it}$.

Setting a= k= β_3= β_4= 0 reduces (1) to the modified Jones model proposed by Dechow et al. (1995), and if, in addition, $\Delta Sales_{it}$ is left unsubtracted from ΔAR_{it}, then I obtain the original Jones (1991) model. In other words, the FLMJ model includes three adjustments to the MJ model. First, rather than assuming all credit sales are discretionary, the model treats part of the increase in credit sales as expected by regressing ΔAR_{it} on $\Delta Sales_{it}$. Second, a portion of total accruals is assumed to be predictable and captured by including last year's accruals (i.e., lagged total accruals) in the model. Third, the modified Jones model treats increases in inventory made in anticipation of higher sales as an abnormal accrual reflecting earnings manipulation rather than as a rational increase in inventory. Including future sales growth corrects for such misclassifications; however, it means that the FLMJ model uses future period data to estimate current period normal and abnormal accruals.

Table 1 summarizes the sample statistics for estimating the FLMJ model. The data used to estimate the model are obtained from the Compustat industry annual file. I use the cash flow statement approach to calculate accruals. I exclude firms in financial and regulated industries (SIC code 4400-5000 and 6000-6999) because their accounting rules differ from those of firms in other industries. To estimate k for each industry-year, I delete industry-years that have fewer than 10 firm-year observations.

Table 1
Sample Statistics – Estimation of the FLMJ Model
This table reports the sample statistics (number of industries, industry-years and firm-years) at each step in estimating the FLMJ model.

Steps	Industries	Industry-years	Firm-years
Raw data	69	1,587	97,283
Sufficient data for each variable used in the FLMJ model to construct EM measure	69	1,136	20,038
Exclude financial and regulated industries	48	784	15,073
Exclude industry-years with less than 10 firm-year observations	30	401	13,458
Final sample with valid discretionary accrual estimates	30	401	13,458

I compare the estimation of the FLMJ model in my study and Dechow et al. (2003) in Table 2. As shown in Table 2, the estimated are similar to those reported in Dechow et al. (2003), where about 10% of the estimated k are negative. As in Dechow et al. (2003), I restrict these k estimates to be within 0 and 1 and, thus, the change in sales in equation (1) is reduced by less than 100% of the increase in receivables. The estimated coefficients are similar in these two studies, while the adjusted R-square is slightly higher in my study than in Dechow et al. (2003; 0.253 versus 0.200) as expected since I have a longer sample for estimation. Next, I compute discretionary accruals as the difference between total accrual and estimated non-discretionary accruals, $DA_{it}= A_{it}-NDA_{it}$, where NDA_{it} is calculated as the predicted values from the FLMJ regression in (1).

Table 2
Estimation of the FLMJ and other Jones-type Models
This table reports the estimation of the FLMJ model and the other Jones-type models. In Panel A, I report and compare the estimated coefficients and adjusted R-squares from the FLMJ model estimates in my study and in Dechow et al. (2003). In Panel B, I compare the estimation of the alternative Jones-type models in my study.

	Dechow et al. (2003)	My Study
Estimated k	0.070	0.072
β_1	0.022 (t= 4.27)	0.044 (4.10)
β_2	-0.037 (t= -10.51)	-0.031 (-4.73)
β_3	0.212 (t= 16.35)	0.219 (8.51)
β_4	0.042 (t= 8.98)	0.025 (2.70)
Adj. R^2	0.200	0.253

To justify my choice of the FLMJ model over the other Jones-type models on statistical ground, I estimate other versions of the Jones-type models and compare the performance of the FLMJ model to the performances of the other models. Specifically, I first examine whether the estimated coefficients are consistent with the theoretical predictions in terms of expected signs. I then follow Dechow et al. (2003) to compare model performance using the values of the adjusted R-square. The rationale for this strategy is that, in the Jones-type models, I regress total accruals on variables representing non-discretionary accruals and use the predicted residual from the model as a measure for discretionary accruals; however, this predicted residual may capture some non-discretionary accruals that are omitted from the model. Therefore, by including more non-discretionary accrual variables in the model, I can improve the explanatory power of the model and, in the process, reduce the extent of the measurement error contained in the discretionary accrual proxy.

The alternative models I estimate include the modified Jones model, the lagged modified Jones model, and the FLMJ model without the sales growth variable. These models are specified as follows:

Modified Jones model:

$$\mathbf{Accrual_{it} = \alpha + \beta_1(\Delta sales_{i,t} - \Delta AR_{i,t}) + \beta_2 GPPE_{i,t} + \varepsilon_{i,t}} \quad (4)$$

Lagged modified Jones model:

$$\mathbf{Accrual_{it} = \alpha + \beta_1(\Delta sales_{i,t} - \Delta AR_{i,t}) + \beta_2 GPPE_{i,t} + \beta_3 Accrual_{i,t-1} + \varepsilon_{i,t}} \quad (5)$$

FLMJ model without growth in sales variable:

$$\mathbf{Accrual_{it} = \alpha + \beta_1((1+k)\Delta sales_{i,t} - \Delta AR_{i,t}) + \beta_2 GPPE_{i,t} + \beta_3 Accrual_{i,t-1} + \varepsilon_{i,t}} \quad (6)$$

The results, as shown in Table 3, suggest that all of the models produce estimated coefficients with correct signs and have magnitudes similar to those reported in prior studies. Notably, the FLMJ model produces the highest value of the adjusted R-square (= 0.253) and the "FLMJ model without sales growth component" ranks second with an adjusted R-square value of 0.230.

Table 3

Specification and Estimation of Four Alternative Jones-type Models

Lagged modified Jones model:

$\mathbf{Accrual_{it} = \alpha + \beta_1(\Delta sales_{i,t} - \Delta AR_{i,t}) + \beta_2 GPPE_{i,t} + \beta_3 Accrual_{i,t-1} + \varepsilon_{i,t}}$

FLMJ model without sales growth (FLMJ w/o SG):

$\mathbf{Accrual_{it} = \alpha + \beta_1((1+k)\Delta sales_{i,t} - \Delta AR_{i,t}) + \beta_2 GPPE_{i,t} + \beta_3 Accrual_{i,t-1} + \varepsilon_{i,t}}$

FLMJ model:

$\mathbf{Accrual_{it} = \alpha + \beta_1((1+k)\Delta sales_{i,t} - \Delta AR_{i,t}) + \beta_2 GPPE_{i,t} + \beta_3 Accrual_{i,t-1} + \beta_4 GR\_Sale_{i,(t\sim t+1)} + \varepsilon_{i,t}}$

Models	Industry-year Obs.	α	β_1	β_2	β_3	β_4	Adj. R^2
Modified Jones	401	-0.058 (-9.20)	0.066 (4.40)	-0.040 (-5.49)			0.114
Lagged Model	401	-0.044 (-8.20)	0.066 (4.90)	-0.033 (-5.14)	0.202 (9.42)		0.211
FLMJ w/o SG	401	-0.050 (-10.02)	0.066 (6.16)	-0.028 (-4.38)	0.206 (9.40)		0.230
FLMJ	401	-0.046 (-8.11)	0.044 (4.10)	-0.031 (-4.73)	0.219 (8.51)	0.025 (2.70)	0.253

As shown in equation (1), Dechow et al. (2003) add future sales growth to the Jones model in order to control for variation in normal accruals. The rationale for this inclusion is that firms anticipating sales growth will rationally increase inventory balances. However, there is a problem with using the actual sales changes in period t+1 as a proxy for the expected growth. In particular, the objective of constructing an accrual model in my study is to examine the implications of earnings management for valuation. As Healy (1985) points out, the integration of any information that becomes known only in future periods would make the model useless for ex ante analysis and so, for timely valuation. So the use of variables with values that become known only in the future undermines the practical usefulness of the model. Therefore, in this study I choose to use the FLMJ model without the sales growth variable to estimate discretionary accruals.

Firms with unusual performance are expected to have extreme accruals (see Kothari et al., 2005). I follow the performance-matching methodology described in Kothari et al. (2005) to control for the impact of performance on estimated discretionary accruals. Specifically, I match each firm-year with another firm-year that is in the same industry and year and has the closest ROA to the firm-year in question. I then adjust the discretionary accrual for this firm-year by the discretionary accrual of the matched firm. The performance-adjusted discretionary accrual estimates (referred to hereafter as DA) have a mean of -0.002 and a median of -0.001 across all firms and years.

3.2. Use DA to Identify Extreme Earnings Manipulators

In this empirical test, I investigate the ability of performance-matched DA (or DA for short) to identify extreme earnings manipulators. Specifically, I examine whether DA can be used to identify firms that are targeted by SEC for earnings overstatement. To implement the test, I assign firm-years into DA deciles and examine the distribution of GAAP violators in the DA deciles. Firms create positive discretionary accruals to manage earnings up; therefore, if the discretionary accrual approach is capable of identifying extreme earnings manipulators, I would expect the SEC-GAAP violators to be concentrated in the top deciles of the DA distribution. Although prior studies, such as Dechow et al. (1995), also use GAAP violators to examine their discretionary accrual estimates, none of these studies use the same model (which is the FLMJ model omitting the future sales growth variable) as the one used in this study. Therefore, it is important to perform this test in my study.

To construct the list of SEC GAAP violators, I combine the list of firms that were subjected to SEC enforcement actions for earnings overstatement for the period 1992-2001 from Erickson et al. (2006) and for the period 1994-2003 from Lane and O'Connell (2007). This results in 95 firms. I then use the online WRDS name search tool to identify the GVKEY for each GAAP violator. Out of these 95 firms, 76 firms and 191 firm-years have valid GVKEY values. Out of these 76 firms and 191 firm-years, 14 firms and 34 firm-years are in the sample.

Table 4
Distribution of GAAP Violators in the DA Deciles
The table reports the distribution of GAAP violators in the discretionary accrual deciles, where the discretionary accruals are estimated using the forward-looking modified Jones model and the GAAP violators are obtained from Erickson et al. (2006) for the period 1992-2001 and from Lane and O'Connell (2007) for the period 1994-2003.

DA Deciles	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	Total
1				1			2	1	1	1	**6**
2								1	2		**3**
3					1		1	1			**3**
4						1		1			**2**
5				1				1			**2**
6			1		2			1			**4**
7	1					1			2	1	**5**
8		1				1		1			**3**
9						1	1		1		**3**
10				1			1		1		**3**
Total	**1**	**1**	**1**	**3**	**3**	**4**	**5**	**7**	**7**	**2**	**34**

In Table 4, I report the distribution of these 34 GAAP violators in the DA deciles. Contrary to my prior expectation, I find no evidence of a concentrated distribution of GAAP violators in the top DA deciles. This result suggests that the DA measure estimated from the performance-adjusted FLMJ model does not have enough power to identify extreme earnings manipulators (GAAP violators).

To measure earnings management more accurately, in the next step I focus on a particular type of earnings management for a particular purpose, which is accrual manipulation for the purpose of avoiding negative earnings.

In the next section, I use discretionary accrual estimates to identify firms that manipulate accruals to meet the positive earnings benchmark, following the "distribution of earnings after management approach". In the subsequent section, I present empirical tests for the ability of the proposed measure to capture the notion of earnings management.

3.3. Developing a Refined Earnings Management Measure

Prior studies, such as Matsumoto (2002), define earnings manipulators to be the firm-years with positive DA and non-manipulators to be those with negative DA. However, since some firms may have positive DA by chance instead of by earnings manipulation, defining firm-years with positive DA as manipulators may misclassify many firm-years.

To avoid this pitfall, I use DA together with the zero-earnings benchmark to identify firms that are likely to have manipulated earnings for the purpose of avoiding negative earnings. Firms are motivated to report positive earnings to avoid punishment by the stock market (see Skinner & Sloan, 2002), to maximize management's bonus compensation (see Healy, 1985) and to enhance reputations with stakeholders (see Brown et al., 1995; Burgstahler & Dichev, 1997). One approach they take to achieve the positive earnings benchmark is to create income-increasing discretionary accruals. Therefore, I define earnings manipulators to be the firm-years whose earnings before discretionary accruals are less than zero and whose earnings after discretionary accruals are greater than zero. Since these firms are likely to have created income-increasing discretionary accruals to avoid reporting negative earnings, I refer to them as loss-avoidance accrual manipulators. In this context, "earnings" are measured using earnings before extraordinary items and "discretionary accrual" is the performance-adjusted discretionary accrual estimated from the FLMJ model.

As a next step, I construct a matched non-manipulator control sample. To do so, I first create a group of firms-years that have earnings before and after discretionary accrual both greater than zero. Since these firms do not need to manipulate accruals in order to produce positive earnings, I refer to them as non-manipulators. Finally, to construct the matched non-manipulator control sample, I match each firm-year in the manipulator group with another firm-year in the non-manipulator group that is in the same industry and year and has the closest lagged total assets (a measure of firm size) to the firm-year in question. Note that I previously matched each firm-year with another firm-year based on industry, year and ROA to construct performance-adjusted discretionary accruals. The purpose of that match was to control for the impact of performance on the magnitude of DA at the firm-year level. I now perform another match to construct the control sample. The purpose of this particular match is to control for group differences in aspects other than accrual manipulation to ensure that the results I observe later are due to manipulation rather than to differences between the two groups in other aspects. These two matches are not redundant and are both necessary to adequately control for confounding factors and alternative explanations.

IV. RESULTS AND DISCUSSION

To test the ability of this measure to capture the notion of earnings management, I examine whether the classified manipulators have higher deferred tax expense (DTE) and special items than the matched non-manipulators. Phillips et al. (2003) propose to use the DTE to detect earnings management. The argument for this is that the DTE is a component of a firm's total income tax expense. As such, it reflects the tax effects of temporary differences between book income and taxable income that arise primarily from accruals for revenue and expense items that affect book income and taxable income in different periods. Managers typically have more discretion under GAAP than under U.S. tax rules. If managers manage earnings upwards, they are expected to use their discretion under the GAAP in ways that do not affect current taxable income. If this is the case, then their accounting choices will generate book-tax differences that increase the DTE.[1] This argument suggests that the DTE is expected to be higher for earnings manipulators than for non-manipulators. The classified manipulators are also expected to have higher special items because prior studies, such as Marquardt and Wiedman (2002), have found that firms manage earnings through special items to avoid reporting losses and earnings decreases. In Table 5, it is clear that manipulators have significantly higher DTE and special items than non-manipulators. These results provide evidence in support of my classification of accrual manipulators and non-manipulators.

Table 5

Test of the Earnings Management Measure – Ability to Detect Earnings Management Activities

This table reports the DTE and Special Items for loss-avoidance accrual manipulators and non-manipulators. Also reported are the differences in DTE and special items between the two manipulation groups.

Motivation to Manipulate	DTE	Special Items
Manipulator	-0.0001	0.0025
Non-manipulator	-0.0021	-0.0261
Difference	0.002 (t= 2.574)	0.0286 (t= 10.89)

V. CONCLUSION

Earnings has been seen by investors as the single most important metrics to evaluate firm performance. Due to its importance, firms intentionally manipulate earnings to meet a specific benchmark. These earnings management activities significant reduce the usefulness of earnings to reflect a firm's true economic performance. Prior research has developed three main approaches to detect and measure earnings management. However, due to the complexity in how firms can manipulate earnings, none of the existing measures is perfect in capturing the overall extent of earnings

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[1] DTE is measured by a firm's deferred tax expense (Compustat data item #50) in year t, scaled by total assets (Compustat data item #6) in year t-1. DTE is a variable in change form derived from changes in balance sheet accounts, and is unlikely to follow a random walk. If managers engage in earnings management to increase earnings but not taxable income then, regardless of how the target is defined, such earnings management generates book-tax differences that result in a higher DTE than would be observed in the absence of such activity. Thus, the level of DTE, not the change in DTE, is the appropriate variable (Phillips et al., 2003).

management. This study builds on existing research to develop a more accurate measure of earnings management. Empirical results show that this new measure is more accurate in detecting firms' earnings management activities. This study contributes to earnings management literature and research on financial reporting quality. The results of this paper has practical implications. In particular, practitioners (financial analysts and investors) can use the new measure developed in this study to more accurately detect firms' earnings management activities. This enables practitioners to better interpret firms' financial statements and earnings news.

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