Vol. 19 No. 3
MANAGEMENT ACCOUNTING Quarterly
Spring 2018

Overhead Cost Allocation and Earnings Manipulation between Quarters

By Susan Wahab, Ph.D., CPA; Karen Teitel, Ph.D.; and Carl Smith, Ph.D., CMA, CFM, CPA

EXECUTIVE SUMMARY

Much as with annual earnings reports, the potential exists for management to manipulate quarterly earnings reports to improve certain metrics and increase bonuses and other rewards. This study examines the conditions in which applied overhead rates could be used to manipulate quarterly earnings reports and finds evidence that such manipulation could be occurring.

A lot of research as well as news stories have investigated the opportunistic manipulation of public companies' reported annual earnings by management teams that are essentially incentivized to meet or beat analysts' earnings forecasts to achieve higher compensation, maximize share price, maintain credibility among constituencies, and avoid litigation costs. Yet scant research has investigated quarterly earnings management—even though management teams face the same incentives and have greater opportunities to influence reported quarterly earnings.

An understanding of the various ways management might manipulate quarterly earnings is important because such manipulation not only creates biases in reported earnings, but it also reduces earnings predictability, introducing noise into stock prices and reducing pricing efficiency. This study investigates whether management opportunistically inflates or deflates estimated manufacturing overhead costs allocated to cost of goods sold to manipulate earnings per share (EPS) between quarters.

Unlike prior studies investigating the use of accruals to manage quarterly and annual financial reports required under Generally Accepted Accounting Principles (GAAP), we selected a non-GAAP metric that is manipulated on a

quarterly basis for internal management purposes (such as product pricing and tracking of divisional profit margins) to determine its impact on the earnings quality of financial reports. This study is the first to shed light on how manipulation of "applied overhead rates" to improve internally reported performance metrics upon which management's quarterly bonuses and promotions are based also impacts externally reported quarterly financial statements.

Companies are not bound by GAAP when allocating overhead costs on a quarterly basis using applied overhead rates. But they must report actual overhead costs annually for external financial reports under GAAP; therefore, any manipulation between quarters must be reconciled to actual amounts by year-end, according to the integral method of quarterly reporting. When preparing quarterly financial statements, management must estimate the amount of manufacturing overhead costs included in cost of goods sold through use of applied overhead rates. This rate is predetermined at the beginning of the current year based on an estimate of the total amount of annual manufacturing overhead costs expected to be incurred in the current year divided by an estimate of the total amount of the selected allocation base expected for the current year.

Research on the manipulation of applied overhead rates is limited as management accountants are not required under GAAP to disclose the estimates that they use to calculate this rate in either quarterly or annual financial statements. As sales and gross profit margins become increasingly important metrics of corporate performance to investors and Wall Street analysts, an understanding of potential manipulation of these items by management via changes in applied overhead rates in cost of goods sold takes on added importance and relevance with direct implications for earnings quality. Research in this area is needed, especially given that 98% of the approximately 2,000 CFOs that Ernst & Young (EY) and IMA® (Institute of Management Accountants) surveyed reported some inaccuracies in cost information, pointing to overhead allocation rates as the most likely cause.[1]

Our research uncovered evidence indicating that management teams at many public companies use overhead rates to manipulate interim quarters' gross profit margins. Companies that report actual first-quarter EPS lower than forecasted EPS for the first quarter often bias the next three quarters' gross profit margins upward, resulting in actual EPS being closer to forecasted EPS and, at times, greater than forecasted EPS. Conversely, companies that report actual first-quarter EPS that meet or beat analysts' forecasts, absent any change in interim expenses, tend to reduce the gross profit margins that they report for the last three quarters, as the first quarter allowed management to build a cushion for future quarters that year.

This study adds to the existing literature on earnings management by:

1. Providing evidence of earnings manipulation using a specific accounting metric—overhead allocation—rather than aggregate accruals;
2. Identifying conditions under which earnings manipulation between quarters (rather than on an annual basis) is likely to occur; and
3. Presenting preliminary evidence on how a metric manipulated for managerial reporting purposes and used by management for their personal gain can directly affect external financial reports that capital markets participants use, reducing earnings quality.

Essentially, manipulation of overhead allocation is another source of information asymmetry between management and the users of financial statements. Results of this study should be of interest to policy makers and regulators because the determination of applied overhead rates is not disclosed in either audited annual or unaudited quarterly financial statements.

LITERATURE REVIEW

Improving the design of internal cost accounting systems (in particular, overhead allocation) can enable management to obtain more accurate product costs, competitively price products, make more informative "make or buy" decisions, and reduce product manufacturing costs. Activity-based costing is believed to result in more accurate measures of product costing by allocating overhead costs to products based on the way these costs are consumed during production. Yet agency theory states that management has incentives to undermine this objective if bonuses depend on profit

margins. By opportunistically lowering the overhead allocation rate, management can reduce product costs and, thus, increase profit margins. A system designed to improve product costing may conflict directly with management's desire to produce internal performance reports that lead to higher bonuses.[2]

The focus of this study is to examine the implications of management's decisions to opportunistically manipulate overhead allocation rates on the earnings quality of quarterly financial reports. Earnings quality is defined two ways in the literature:

1. Persistent or predictable earnings are of higher quality than transitory earnings (impacted by one-time events), and
2. "Unmanaged" earnings (earnings not opportunistically manipulated by management) are of higher quality than "managed" earnings.

These two aspects are of equal importance as equity values are based on future earnings, which should be both predictable to some extent using current earnings and unbiased or free of management's manipulation.[3]

Earnings Quality Impacted by Earnings Management

This study attempts to provide an understanding of how management manipulates earnings between quarters by comparing overhead costs allocated to cost of goods sold. Given that this line item represents the biggest cost component of a typical firm, more research regarding its manipulation and its effect on earnings quality is needed, a void this study aims to fill. Although there is extensive research focusing on detecting and mitigating earnings manipulation by management on both an annual and quarterly basis, the discussion that follows focuses on previous studies relevant to this article.

According to Eli Amir, Eti Einhorn, and Itay Kama, an understanding of the accounting reporting process and fundamental correlations between disaggregated components of financial reports should enable investors to identify earnings manipulation.[4] Support for using the disaggregation of accounts on financial statements to determine if earnings were manipulated is predicated on the notion of different line items being stochastically interrelated.[5] That is, certain items are highly correlated with each other (e.g., sales and cost of goods sold).

Accounting measurement rules indicate that these ratios should follow a systematic behavioral pattern from one quarter to the next, except during periods of either economic shocks or earnings management.[6] Managers have different incentives and degrees of discretion in manipulating various line items on accounting reports. Because the ratio of the cost of goods sold to sales is fairly stable, manipulation by management of the proportion of allocated overhead costs to cost of goods sold between quarters may be detected by investors.

In particular, there are opportunities as well as incentives for management to manipulate items on the income statement differently on a quarterly basis than on an annual basis. Because of the accounting and auditing process, there are more opportunities for management to use estimates and discretion in interim reporting periods than in the fourth-quarter (or year-end) financial statements. First, because quarterly financial statements are not audited, this allows greater managerial discretion in interim quarters. Due to auditors' legal liability if earnings are overstated, management has fewer opportunities to be aggressive in its estimates and accounting choices for income-increasing earnings management in the fourth-quarter (or year-end) financial statements compared to interim quarters. Second, accounting disclosure requirements are not as detailed in quarterly financial statements, resulting in less information being disclosed and, hence, less transparency. Third, the integral method of expense estimation in interim quarters requires companies to estimate an annual expense and apply it to each quarter on a pro rata basis; this applies to estimation of applied overhead rates used in calculating cost of goods sold, which is the basis for this study. Yet an argument can be made that incentives to manage fourth-quarter (or year-end) earnings are higher than in interim quarters as corrections of interim periods' estimates are required, and the pressure to achieve annual target earnings levels is greater (for example, to meet or beat analysts' forecasts, achieve personal bonuses, avoid violating debt covenants, or income smoothing).

As already noted, the integral method allows management discretion as to the amount and timing of estimating interim expenses such as the cost of goods sold;

selling, general, and administrative expenses; and income tax expenses. This flexibility permits companies to manage earnings between quarters within the year by allowing management to estimate the annual expense allocated between quarters. The fourth quarter is then settled up (that is, reconciled) to the actual annual expense. Studies have shown how changes in interim expenses are associated with earnings management.[7] Their findings demonstrate how accountants can easily manage costs subject to interim estimates and allocated across quarters.

Earnings Quality Defined by Earnings Persistence

Persistent earnings components are considered to be of higher quality, while transitory earnings components decrease earnings quality by lowering earnings predictability, introducing noise in earnings numbers and accounting-based equity valuations. While transitory earnings components are triggered mainly by economic events, they also can be caused by the manipulation of reported amounts by management. The former can be easily identified in financial statements by scrutinizing discontinued operations, extraordinary events, asset write-offs, or impairments, while the latter are hidden in financial statements and are not easily identified.

Some studies focus on earnings quality based on its persistent vs. transitory nature.[8] Results of a 2013 study indicate that gross profit is the most persistent indicator of earnings quality on a quarterly basis, and earnings quality decreases as one goes down the income statement since more transitory items are likely to appear below the gross profit line. We extended this study by investigating earnings manipulation in gross profit via manipulation of applied overhead rates between quarters.[9] On a quarterly basis, applied overhead rates can be manipulated up (or down), causing cost of goods sold to be higher (or lower), resulting in lower (or higher) gross profits. Managers can manipulate gross profit between quarters since quarterly financial statements are unaudited, reducing quarterly earnings quality. An examination of the quality of gross profit is critical for cross-validating information contained in reports used for internal management with information contained in external earnings reports used by investors.

DATA AND METHODOLOGY

We collected quarterly data on income statement items from Compustat, while actual EPS and analysts' forecasts of quarterly EPS are from Institutional Brokers' Estimate System (IBES). According to managerial accounting theory, variable expenses are directly proportional to revenues. As the cost of goods sold contains a high proportion of variable expenses relative to fixed expenses, the correlation between the two should remain constant assuming management has not hidden any transitory components in the cost of goods sold or manipulated this amount. Thus, gross profit margin for any particular year should not deviate from the company's "normal" (that is, historical) gross profit margin. In addition, since management is required to calculate applied overhead rates at the beginning of the year, it should use past data as a starting point for the current year's applied overhead rates. These two premises provide support for using last year's actual annual gross profit margin as a measure of "unmanaged" gross profit margin for the current year. We can then assume that any difference between reported quarterly gross profit margin and last year's (unmanaged) gross profit margin is due to management's manipulation.

In the absence of earnings management, in general, we expect each company's reported quarterly gross profit margin to equal last year's actual annual gross profit margin. It is possible, however, that companies deviate from this expectation because of operational and economic conditions. Any deviation should be random, leading to an equal amount of positive and negative differences between quarterly reported and last year's actual annual gross profit margins. Therefore, the first step in providing evidence of quarterly earnings management is to look for differences in reported quarterly gross profit margins from last year's actual annual gross profit margins.

If quarterly reported gross profit margins are greater than or less than last year's actual annual gross profit margins, this is evidence of earnings management. Given management's incentives to increase or decrease gross profit margins to achieve earnings targets or save for the future, the direction of the differences may differ. We therefore examined differences in reported quarterly gross profit margins from last year's actual

annual gross profit margins based on the direction of the forecast error (that is, whether reported quarterly EPS is less than or greater than forecasted quarterly EPS). If companies meet or beat analysts' forecasts, then we expect a greater frequency of quarterly reported gross profit margins exceeding last year's actual annual gross profit margins. If companies miss analysts' forecasts, then we expect a greater frequency of quarterly reported gross profit falling short of last year's actual annual gross profit margin, allowing management to build a cushion for future quarters.

In addition to opportunities to manage gross profit margin afforded by the integral method of reporting, there also are incentives because of the pressure to meet or beat analysts' forecasts of quarterly earnings. A higher threshold for evidence of earnings management is the ability to impact net income to yield positive forecast errors (that is, beat analysts' forecasts of quarterly earnings). Therefore, we investigated patterns in both managed and unmanaged forecast errors.

We define managed forecast errors as reported quarterly EPS (as reported by IBES) minus mean analysts' forecasts (made on the last day prior to the earnings announcement date) scaled by the price at the end of the prior quarter. Unmanaged forecast errors are defined as reported quarterly EPS (as reported by IBES adjusted by the after-tax estimated managed gross profit margin) minus mean analysts' forecasts (made on the last day prior to the quarterly earnings announcement date) scaled by price at the end of the prior quarter.

We partition the data each year by signs of each company's "unmanaged" forecast error in the first quarter, which is a measure of what the forecast error would have been had the company used last year's gross profit margin. If unmanaged EPS is below analysts' forecasts (that is, the forecast error is negative) in the first quarter, then one would expect managers to bias their subsequent interim quarterly gross profit margin estimates upward (that is, income-increasing earnings management), causing managed forecast errors to be less negative (or more positive) than unmanaged forecast errors. An upward-biased interim quarterly gross profit margin is one that is significantly higher than last year's gross profit margin.

If unmanaged EPS equals or exceeds analysts' forecasts (that is, forecast error is zero or positive) in the first quarter, one expects managers to bias their interim quarterly gross profit margin estimates downward (that is, income-decreasing earnings management). Conditional on already beating quarterly earnings targets, managers will want to record a lower interim gross profit margin than last year to have some cushion for reporting a higher gross profit margin at year-end. Managers who lowered their interim quarterly gross profit margin estimates are more likely to meet or beat annual analysts' forecasts as they have built up a cushion in their reported cost of goods sold amount, which must be adjusted to the actual amount at year-end. We investigate whether changes in gross profit margin are larger when companies would have otherwise missed or beat their quarterly analyst earnings forecast if they used last year's gross profit margin.

We conducted all analyses after partitioning the data based on company size. We partitioned the data for each year into quintiles based on company size measured by the previous year's market value of equity. Large companies are increasingly subjected to continuous auditing, inhibiting management's ability to manage gross profit margin across quarters.[10] We expect smaller companies to have larger differences between unmanaged and managed gross profit margin across interim quarters.

Finally, we deleted any company observations with gross profit margins greater than one or less than zero as well as the extreme 2% of variable distributions.

RESULTS

Table 1 reports descriptive statistics. The average reported gross profit margin is less than the average unmanaged gross profit margin (the gross profit margin that would have been reported if management used last year's gross profit margin). This is consistent with gross profit margins decreasing over time because of increasing costs or price competition, as well as interim gross profit margins being understated relative to last year's gross profit margin. While mean managed gross profit margin is negative, the median is positive.

To determine if gross profit margin is manipulated on a quarterly basis, we examined differences in reported

Table 1: Descriptive Statistics
(N=79,439 company-quarter observations 1991-2016)

Variable	Mean	Std. Dev.	25th Percentile	Median	75th Percentile
Quarterly Sales Revenues (in millions)	254.230	27.247	71.973	200.257	764.478
Quarterly Cost of Goods Sold (**COGS**) (in millions)	172.662	12.105	38.571	124.433	614.004
% Quarterly Gross Profit Margin (**%GPM**)	0.430	0.257	0.400	0.591	0.220
% Unmanaged Gross Profit Margin (**%UGPM**)	0.434	0.262	0.403	0.593	0.218
% Managed GPM (**%MGPM**)	-0.003	-0.025	-0.001	0.021	0.083
Quarterly Earnings Per Share (**EPS**)	0.222	0.040	0.180	0.350	0.396
Analysts Forecast EPS (**AF**)	0.218	0.040	0.170	0.340	0.376
Forecast Error (**FE**)	0.000	-0.001	0.000	0.002	0.008
Unmanaged Forecast Error (**UFE**)	0.001	-0.003	0.000	0.005	0.019

- % Quarterly Gross Profit Margin (%GPM) = (Quarterly Sales Revenues – Quarterly COGS) / Quarterly Sales Revenues.
- % Unmanaged Gross Profit Margin (%UGPM) = (Annual Sales Revenues – Annual COGS) / Annual Sales Revenues.
- % Managed GPM (%MGPM) = %GPM – %UGPM.
- Analysts Forecast (AF) = Mean of quarterly Analysts Forecasts of EPS on last day prior to current quarter's earnings announcement.
- Forecast Error (FE) = (EPS – AF) / Price per Share at end of prior quarter.
- Unmanaged Forecast Error (UFE) = {EPS – [(Sales Revenues * %MGPM * (1 – Effective tax rate)) / Common shares outstanding] – AF} / Price Per Share at end of prior quarter.

The extreme 1st and 99th percentiles of observations were deleted. %GPM and %UGPM <0 and >1 are deleted.

quarterly gross profit margins from last year's actual annual gross profit margins based on the sign of their current-quarter forecast error (also partitioned on the company's market value at the end of the previous year). Under an assumption that management has not manipulated sales (as well as direct labor and direct materials portions of cost of goods sold), gross profit margin should capture any manipulation of the overhead portion of the cost of goods sold through the use of estimated applied overhead rates. If management does not use gross profit margin to manage reported EPS, the number of companies increasing their current-quarter gross profit margin over last year's gross profit margin would be expected to be equal to the number of companies decreasing their current-quarter gross profit margin, regardless of whether they report positive or negative forecast errors.

Table 2 reports the proportion of observations that have positive and negative managed gross profit margins conditioned on the direction of the quarterly forecast error and size of the company. The proportion of observations with positive managed gross profit margins are reported in column A, and the proportion of negative observations are reported in column B.

When companies' current-quarter EPS is greater than or equal to analysts' forecasts, results indicate that differences in reported quarterly gross profit margins from last year's actual annual gross profit margins are positive and statistically significant for 15 of the 20 company quarter-quintiles, consistent with management using the applied overhead rates as an earnings management tool to increase quarterly gross profit margin to achieve a positive forecast error (that is, beat analysts' forecasts). Interestingly, the quarter-quintiles that are not statistically significant occur in the first and fourth quarter and are primarily larger companies. These results are consistent with large companies that meet or beat analysts' forecasts, experiencing constraints on earnings management due to the continuous auditing process.[11] In contrast, when companies' current-quarter EPS is less than analysts' forecasts, differences in reported quarterly gross profit margins from last year's actual annual gross

Table 2: Proportion of Company Quarter Observations with Positive and Negative % Managed GPM

Conditional on Current Quarterly EPS ≥ AF or EPS < AF. Companies Are Partitioned by Size Based on Last Year's Market Value of Equity.

EPS ≥ AF	Quarter 1		Quarter 2		Quarter 3		Quarter 4	
	A +	B -	A +	B -	A +	B -	A +	B -
Quintile 1 - smallest	53.25***	46.75	56.96***	43.04	57.52***	42.48	56.71***	43.29
Quintile 2	51.65	48.35	56.53***	43.47	52.78**	47.22	53.05**	46.95
Quintile 3	51.03	48.97	55.30***	44.70	52.24*	47.76	53.55***	46.45
Quintile 4	50.53	49.47	53.68***	46.32	52.28*	47.72	51.78	48.22
Quintile 5 - largest	52.20*	47.80	55.43***	44.57	54.52***	45.48	51.38	48.62

EPS < AF	Quarter 1		Quarter 2		Quarter 3		Quarter 4	
	A +	B -	A +	B -	A +	B -	A +	B -
Quintile 1 - smallest	35.88***	64.12	39.90***	60.10	38.51***	61.49	38.80***	61.20
Quintile 2	36.49***	63.51	37.20***	62.80	37.78***	62.22	39.25***	60.75
Quintile 3	37.34***	62.66	42.72***	57.28	40.70***	59.30	37.81***	62.19
Quintile 4	36.49***	63.51	39.76***	60.24	40.25***	59.25	37.76***	62.24
Quintile 5 - largest	41.52***	58.48	43.04***	56.96	42.74***	57.26	40.38***	59.62

- A: Proportion of company quarters for which Quarterly % Gross Profit Margin (%GPM) exceeds % last year's Gross Profit Margin (%UGPC).
- B: Proportion of company quarters for which Quarterly % Gross Profit Margin (%GPM) is below % last year's Gross Profit Margin (%UGPC).

*, **, *** differences in proportions are significant at Chi square p-value's at the 5%, 1%, and 0.1% significance levels, respectively.

AF = Mean of Analysts Forecasts on last day prior to current quarter's earnings.

The extreme 1st and 99th percentiles of observations were deleted. %GPM and %UGPM <0 and >1 are deleted.

profit margins are negative and statistically significant for all quarters and all size partitions.

While the results provide *ex post* evidence of manipulation of gross profit margin on a quarterly basis to meet or beat analysts' earnings forecasts, our goal was to investigate earnings management between quarters *ex ante*. To test this, we partitioned the data each year based on:

1. The signs of each company's unmanaged forecast error in the first quarter. Results management would anticipate reporting if last year's gross profit margin had been used instead of the current quarter's gross profit margin; and
2. The company's market value in the previous year.

Table 3 reports the direction that management changes gross profit margin over that of last year's conditioned on the first quarter's unmanaged gross profit margin. If unmanaged forecast error is negative in the first quarter (that is, if management used last year's gross profit margin for interim integral reporting, they would end up reporting a negative quarterly forecast error), managers are expected to bias their interim quarterly gross profit margin estimates upward (that is, income-increasing earnings management), causing forecast errors to be less negative or even positive.

Likewise, if unmanaged forecast error is zero or positive in the first quarter (that is, if management used last year's gross profit margin for interim integral reporting, they would end up meeting or beating analysts quarterly forecasts), managers may bias their interim quarterly gross profit margin estimates downward (that is, income-decreasing earnings management), creating a

Table 3: Mean Quarterly Forecast Errors (FE), Unmanaged Forecast Errors (UFE), and Managed Gross Profit Margin (%MGPM) Conditional on Positive and Negative UFE in the First Quarter

Companies Are Partitioned by Size Based on Last Year's Market Value of Equity.

		Q1: UFE < 0			
	N	FE	UFE	FE-DIFF	%MGPM
Quintile 1: Smallest companies					
Quarter 1	1,652	-0.0045	-0.0113	0.0068***	0.0235***
Quarter 2	1,055	-0.0019	-0.0059	0.0041***	0.0168***
Quarter 3	1,028	-0.0019	-0.0049	0.0030***	0.0158***
Quarter 4	843	-0.0017	-0.0030	0.0013	0.0158***
Quintile 2					
Quarter 1	1,628	-0.0029	-0.0088	0.0059***	0.0271***
Quarter 2	1,251	-0.0003	-0.0037	0.0034***	0.0203***
Quarter 3	1,178	-0.0004	-0.0026	0.0022***	0.0156***
Quarter 4	1,068	-0.0005	-0.0019	0.0014*	0.0117***
Quintile 3					
Quarter 1	1,581	-0.0018	-0.0077	0.0059***	0.0274***
Quarter 2	1,281	0.0003	-0.0041	0.0044***	0.0235***
Quarter 3	1,249	-0.0002	-0.0032	0.0030***	0.0158***
Quarter 4	1,134	-0.0004	-0.0026	0.0022***	0.0143***
Quintile 4					
Quarter 1	1,520	-0.0014	-0.0076	0.0062***	0.0259***
Quarter 2	1,284	0.0000	-0.0040	0.0040***	0.0202***
Quarter 3	1,235	-0.0002	-0.0038	0.0036***	0.0179***
Quarter 4	1,192	0.0002	-0.0020	0.0022***	0.0116***
Quintile 5: Largest companies					
Quarter 1	1,650	-0.0008	-0.0085	0.0077***	0.0261***
Quarter 2	1,450	0.0000	-0.0037	0.0037***	0.0192***
Quarter 3	1,380	0.0002	-0.0036	0.0038***	0.0168***
Quarter 4	1,253	0.0002	-0.0013	0.0015**	0.0096***

		Q1: UFE ≥ 0			
	N	FE	UFE	FE-DIFF	%MGPM
Quintile 1: Smallest companies					
Quarter 1	1,919	0.0029	0.0114	-0.0085***	-0.0288***
Quarter 2	1,317	0.0006	0.0058	-0.0052***	-0.0207***
Quarter 3	1,253	-0.0007	0.0043	-0.0050***	-0.0212***
Quarter 4	1,087	-0.0005	0.0057	-0.0062***	-0.0226***
Quintile 2					
Quarter 1	2,212	0.0025	0.0085	-0.0060***	-0.0247***
Quarter 2	1,693	0.0007	0.0044	-0.0036***	-0.0140***
Quarter 3	1,661	0.0005	0.0046	-0.0041***	-0.0181***
Quarter 4	1,511	0.0000	0.0050	-0.0050***	-0.0211***

(continues on next page)

Q1: UFE ≥ 0

	N	FE	UFE	FE-DIFF	%MGPM
Quintile 3					
Quarter 1	2,299	0.0020	0.0076	-0.0056***	-0.0285***
Quarter 2	1,847	0.0006	0.0038	-0.0033***	-0.0174***
Quarter 3	1,816	0.0004	0.0045	-0.0041***	-0.0215***
Quarter 4	1,684	0.0004	0.0048	-0.0044***	-0.0189***
Quintile 4					
Quarter 1	2,350	0.0017	0.0068	-0.0051***	-0.0235***
Quarter 2	1,981	0.0007	0.0041	-0.0035***	-0.0158***
Quarter 3	1,945	0.0005	0.0036	-0.0031***	-0.0149***
Quarter 4	1,842	0.0004	0.0048	-0.0044***	-0.0210***
Quintile 5: Largest companies					
Quarter 1	2,260	0.0016	0.0086	-0.0070***	-0.0251***
Quarter 2	1,917	0.0008	0.0045	-0.0037***	-0.0181***
Quarter 3	1,867	0.0007	0.0038	-0.0031***	-0.0192***
Quarter 4	1,698	0.0003	0.0048	-0.0044***	-0.0233***

- FE = (EPS – AF) / Price per Share at end of prior quarter.
- Unmanaged Forecast Error (UFE) = {EPS – [(Sales Revenues * %MGPM * (1 – Effective tax rate)) / Common shares outstanding] – AF} / Price Per Share at end of prior quarter.
- Forecast Error Difference (FE – DIFF) = FE – UFE.
- %Managed GPM (%MGPM) = %GPM – %UGPM.

The extreme 1st and 99th percentiles of observations were deleted. %GPM and %UGPM <0 and >1 are deleted.

*, **, *** the mean is different from zero with a p-value less than 0.05, 0.01, and 0.001, respectively.

cushion to meet earnings targets for future quarters. Therefore, management may exercise discretion in accounting for the cost of goods sold in interim quarters knowing the effect this will have on the fourth quarter, similar to what has been reported in earlier studies investigating the estimation of quarterly effective tax rates.[12]

As expected, when the first quarter's unmanaged forecast error is negative, management increases gross profit margin over that of the previous year, resulting in a managed forecast error that is less negative or positive relative to unmanaged forecast errors across all quarter-quintiles. The results also indicate that the unmanaged forecast error gets smaller across quarters within size partitions. This is consistent with prior research demonstrating that analysts' forecast errors are the highest in the first quarter, reflecting analysts' optimism, and get smaller as the year progresses. Only large companies are able to turn a negative unmanaged forecast error into a positive forecast error by the fourth quarter, likely attributable to their greater access to analysts compared to small companies.

When the first quarter's unmanaged forecast error is zero or positive, management decreases its reported gross profit margin over that of last year's in all quarter-quintiles, resulting in less-positive forecast errors and creating a cushion for future quarters. Consistent with analysts being overly optimistic in the first quarter, the first quarter's forecast errors are larger than those of any other quarter. Interestingly, companies in the smallest quintiles appear to reduce gross profit too much and change from a positive to a negative forecast error by the fourth quarter. This may reflect their weaker information environment relative to large companies.

The results are consistent with management using applied overhead rates to manipulate gross profit margins in interim quarters. In certain contexts where there is both an opportunity for management accountants to

manipulate gross profit margin and pressure to achieve certain earnings targets, this study finds evidence of gross profit manipulation by public companies' management teams.

FUTURE RESEARCH

By focusing on estimated manufacturing overhead costs allocated to the cost of goods sold, this study employs a management accounting concept to address research questions usually investigated by financial accounting researchers. The results suggest that combining the two perspectives of managerial and financial accounting may be a fruitful area of research benefiting both disciplines. ■

Susan Wahab, Ph.D., CPA, is a professor of accounting at the University of Hartford. She can be reached at (860) 768-4184 or suwahab@hartford.edu.

Karen Teitel, Ph.D., is an associate professor of accounting at the College of the Holy Cross and a member of IMA's Worcester Area Chapter. She can be reached at (508) 793-2679 or kteitel@holycross.edu.

Carl Smith, Ph.D., CMA, CFM, CPA, is an associate professor of accounting at the University of Hartford, a member of IMA's Hartford Chapter, and a former IMA Chair. He can be reached at (860) 768-4343 or casmith@hartford.edu.

ENDNOTES

1 Ernst & Young and IMA® (Institute of Management Accountants), "The State of Management Accounting," *2003 Survey of Management Accounting*, 2003.
2 Alfred Wagenhofer, "The value of distorting overhead cost allocations in an agency setting," *Management Accounting Research*, December 1996, pp. 367-385.
3 Patricia M. Dechow and Catherine M. Schrand, *Earnings Quality*, The Research Foundation of the CFA Institute, Charlottesville, Va., 2004.
4 Eli Amir, Eti Einhorn, and Itay Kama, "The role of accounting disaggregation in detecting and mitigating earnings management," *Review of Accounting Studies*, March 2014, pp. 43-68.
5 Doron Nissim and Stephen H. Penman, "Ratio analysis and equity valuation: from research to practice," *Review of Accounting Studies*, March 2001, pp. 109–154.
6 Amir, Einhorn, and Kama, 2014.
7 Joseph Comprix, Lillian Mills, and Andrew Schmidt, "Earnings Management to Meet or Beat Analyst Earnings Forecasts Through Changes in Interim Expenses," working paper, Arizona State University, August 2006.
8 Eli Amir, Eti Einhorn, and Itay Kama, "Extracting Sustainable Earnings from Profit Margin," *European Accounting Review*, 2013, pp. 685-7188.
9 *Ibid.*
10 William Kross and Doug Schroeder, "An investigation of seasonality in stock price responses to quarterly earnings announcements," *Journal of Business Finance and Accounting*, December 1990, pp. 649-675.
11 *Ibid.*
12 Joseph Comprix, Lillian Mills, and Andrew Schmidt, "Bias in Quarterly Estimates of Annual Effective Tax Rates and Earnings Management," *Journal of the American Taxation Association*, Spring 2012, pp. 31-53.