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Extracting Sustainable Earnings from Profit Margins

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ABSTRACT Revenues and expenses are fundamentally proportional to one another, but are likely to be disproportionally affected by transitory items or economic shocks. We build on this observation and propose a new measure of sustainable earnings based on deviations from normal profit margins. While some other sustainable earnings metrics attempt to identify transitory components on a line-by-line basis, our measure, referred to as the intensity of core earnings (ICE), uses ratio analysis to extract the transitory portion of earnings from all line items. We find that the ICE, as measured here, is positively associated with earnings persistence, better earnings predictability, and stronger market reaction to unexpected earnings. We also find that our measure is positively associated with post-earnings announcement excess stock returns. Comparing our measure with an accrual-based measure of earnings quality, we find that, in general, the two metrics provide distinct incremental information relative to one another and in some instances our measure is better than an accrual-based measure in assessing earnings quality.

1. Introduction

Lev's (1989) critique on the limited usefulness of earnings in explaining stock returns prompted researchers to focus on developing and testing direct and indirect measures of earnings quality. Dechow et al. (2010) identify three categories of proxies for earnings quality: (1) properties of earnings (i.e. earnings persistence), (2) investors' responsiveness to earnings (often measured by the earnings response coefficient), and (3) external indicators of earnings misstatements (for

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example, accounting and auditing enforcement releases).[1] While earnings quality can be viewed from different perspectives, including the measurement perspective and the earnings management perspective (Francis et al., 2006), the popular views that have emerged in the literature (Dechow and Schrand, 2004) are associated with the ability of current earnings to predict future earnings and to explain stock returns. Further research into the association between equity values and earnings components has yielded the empirical observation that different components of earnings have different levels of persistence and are therefore priced differentially by equity investors.[2]

Transitory earnings components (which may arise from reporting manipulations, accounting measurement problems, and non-recurring economic events) suppress the persistence and predictability of reported earnings and introduce a substantial amount of noise into the process of accounting-based equity valuation, thereby decreasing earnings quality. Consequently, financial analysts and investors care about the sustainable component of earnings because equity values are based on expected future earnings rather than current earnings. Thus, investors will pay more for sustainable (more persistent) earnings. This is why financial analysis focuses on extracting information on the core (or sustainable) component of earnings using time-series and cross-sectional techniques, separating it from the non-core (or transitory) component.

Although investors can identify some transitory components of earnings by looking at the decomposition of earnings into their reported items, there are other transitory components that are hidden and cannot be detected this way, mostly because of earnings management and the accounting aggregation process. For example, line items such as discontinued operations, extraordinary items, and write-offs are classified as transitory items due to their one-time nature. However, the transitory components of cost of sales, selling general and administrative expenses, and even tax expenses are not easily detectible; these line items can be partially transitory and partially persistent.

This research is about measuring the quality of earnings, and in particular distinguishing between the core (sustainable) and the non-core (transitory) components of earnings using ratio analysis. We propose a new measure for assessing the sustainable component of earnings, based on deviations from normal profit margins. This measure, referred to as the intensity of core earnings (ICE), is derived from the observation that revenues and expenses are fundamentally proportional to one another but are likely to be disproportionally affected by transitory items or economic shocks, meaning that transitory revenues or expenses are likely to alter the fundamental behaviour of profit margins. Consistent with this view, Schilit and Perler (2010) argue that deviations from normal profit margins often indicate accounting manipulation, though they could also be due to one-time events leading to transitory earnings components.

Thus, financial statement users can identify deviations of an earnings number (gross profit, operating earnings, or net income) from what is expected, and use

these deviations to distinguish between core (sustainable) and non-core (transitory) earnings, thereby assessing earnings persistence and predictability. In particular, we expect that the larger the deviation of an earnings number from what is expected, the lower the persistence and predictability of earnings, which will also be reflected in a lower market reaction to unexpected earnings.

The frequent use of both time-series and cross-sectional data in financial analysis motivates us to use two alternative proxies for normal profit margins. The first is the firm-specific average profit margin over the preceding four years (time-series), which is based on the assumption that profit margins revert to their fundamental value over time. The second measure is the current average profit margin in the industry to which the firm belongs (cross-section); while each firm may deviate from its fundamental profit margin, the average profit margin in the industry is assumed to be an unbiased measure of the fundamental profit margin.[3] Using these proxies for normal profit margin, we estimate core earnings by multiplying the normal profit margin by current sales. We then estimate non-core earnings as the difference between actual and core earnings. Based on estimates of core and non-core components of earnings, we measure the ICE as the absolute value of the core component of earnings divided by the sum of the absolute values of the core and the non-core components of earnings.

The first advantage of using the ICE as a measure of earnings quality is its simplicity. It is possible to calculate the ICE for each firm/quarter provided enough prior data is available. It is also possible to apply the ICE measure to private companies, as it does not rely on market data. In addition, this measure can be applied to different levels of profit aggregation – gross profit, operating profit, and net income. Moreover, while some other earnings quality measures identify transitory components on a line-by-line basis, our measure uses ratio analysis to extract the transitory component of earnings from all line items. It is comprehensive and less dependent on the quality of accounting disclosure. The ICE measure may have certain limitations due primarily to its simplicity. For instance, sudden changes in cost structure may appear as a deviation from normal profit margin in the short run until the earnings stabilise.

Our empirical tests are based on a large sample that covers the years 1990–2009 and includes all available firm/quarter observations with complete price and financial data on Compustat and CRSP, excluding financial institutions and public utilities. We begin our analysis by investigating the persistence of overall earnings, the core component and the non-core component. Using cross-sectional and time-series regressions, we find that the persistence of core earnings is substantially larger than the persistence of non-core earnings. In addition, we find that the persistence of earnings increases monotonically with the ICE, as measured here. These results indicate that the ICE is a valid measure of earnings persistence, which is an important property of earnings quality.

We continue by analysing the link between the ICE and three attributes of analysts' earnings forecasts: accuracy (the absolute forecast errors), dispersion (the standard deviation of forecasts), and bias (the magnitude of forecast errors). We find evidence suggesting that higher ICE is associated with more accurate earnings forecasts, less dispersed forecasts, and less optimistic forecasts. These results suggest that the ICE is associated with improved earnings predictability. We also find that analysts are, on average, optimistic with respect to companies with low ICE, and pessimistic with respect to companies with the high ICE. This result opens the door to the possibility that our ICE measure is not fully priced by equity investors.

Our market reaction tests indicate that excess stock returns around the announcements of quarterly earnings are positively associated with the ICE. Also, when we sort companies into quintiles based on the ICE, the market reaction to quarterly earnings, measured as average excess stock returns around the preliminary announcements of quarterly earnings, increases monotonically with ICE quintiles. This result is consistent with the argument that the ICE is a valid and useful measure of earnings quality. Furthermore, we find that post-earnings excess stock returns are associated with the ICE, suggesting that the ICE is not fully priced by the market.

A significant portion of the transitory components of earnings may arise from write-offs, capital gains and losses, and other extraordinary and special items, which can be easily identified, as line items, on the income statement. To assess and exclude the effect of these items on our analysis, we also measure the intensity of core operating income (EBIT). Our empirical tests indicate that the intensity measures based on EBIT have similar properties to those of the intensity of core net income. That is, they are associated with higher persistence, better earnings predictability and stronger immediate market reaction. Therefore, the ICE, as measured here, is useful in identifying the transitory components of line items such as sales, cost of sales, and selling general and administrative expenses. That is, the ICE is useful even when the transitory components are not easily detectable by the financial statement user, as is the case in operating income.

Consistent with the common practice of presenting certain non-recurring items below operating income, we also find that the ICE decreases as we go down the income statement: the intensity of core net income is lower than that of core EBIT, which in turn is lower than that of gross profit. Furthermore, the contribution of the ICE to earnings persistence increases monotonically as we go down the income statement due to the decrease in the persistence of non-core earnings.

Our proposed earnings quality measure can be computed for any definition of core versus non-core earnings components. In particular, it is possible to compare it to an intensity measure based on cash flows from operations (CFO). Sloan (1996) finds that the accrual and cash flow components of earnings have

differential persistence, and that a larger CFO component of earnings increases its overall persistence. That is, earnings quality increases with the intensity of CFO. Consistent with Sloan (1996), we compute the intensity of current operating cash flows as the absolute value of current CFO divided by the absolute value of current CFO plus the absolute value of current accruals, and a cash-based intensity measure based on deviations from average cash-to-sales ratios. We find that our ICE measure and the intensity of operating cash flows provide distinct information relative to one another in explaining earnings persistence. We also find that our ICE measure is incremental to, or better than, a measure based on the intensity of CFO, in explaining immediate and delayed market reaction to quarterly earnings announcements. Overall, the evidence provided here suggests that the ICE measure provides useful information in identifying hidden transitory components of earnings and assessing sustainable earnings, thereby improving the accuracy of earnings forecasts and the explanatory power of stock returns.

We contribute to the literature on measuring earnings quality by introducing a powerful, yet simple, measure of earnings quality based on deviations from normal profit margins. Prior studies have documented mean reversion in firm profitability (Freeman et al., 1982; Fairfield et al., 1996; Fama and French, 2000). Nissim and Penman (2001) argue that profitability and other ratios tend to revert back to typical values over time, so benchmarking ratios against the past gives a sense of what is normal and what is abnormal. While these and other studies have identified the mean-reversion characteristic of profit margins, to our knowledge, no prior study has explicitly used this characteristic of profit margins to design and test a simple measure of earnings quality. This measure is associated with (1) the persistence of reported earnings, (2) better earnings predictability, and (3) the power of earnings to explain excess stock returns around the announcements of quarterly earnings.

2. The Intensity of Core Earnings (ICE)

The basic premise of this study is that current and past profit margins can be used to construct a useful measure of core (sustainable) earnings, separating out the non-core (transitory) component. For each firm i and quarter t, a profit margin is defined as Profit_{it} divided by total sales (Sales_{it}), where Profit_{it} is net income (NI_{it}), or operating income before interest and taxes (EBIT_{it}) or gross profit (GP_{it}), equal to sales minus cost of sales. That is, $\text{NPM}_{it} = \text{NI}_{it}/\text{Sales}_{it}$, $\text{OPM}_{it} = \text{EBIT}_{it}/\text{Sales}_{it}$, and $\text{GPM}_{it} = \text{GP}_{it}/\text{Sales}_{it}$.

We use two benchmarks for separating the core from the non-core component of income: a firm-specific benchmark based on previous profit margins and an industry benchmark. These benchmarks reflect the common practice of using time-series as well as cross-sectional financial analysis.

Using the firm itself as a benchmark, we define the core component of profit (FCORE_{it}) as firm i's profit margin averaged over the same quarter in the previous four years, multiplied by current sales. That is:

$$\begin{aligned}\text{FCORE(NI)}_{it} &= [(\text{NPM}_{i,t-4} + \text{NPM}_{i,t-8} + \text{NPM}_{i,t-12} + \text{NPM}_{i,t-16})/4] \\ &\quad \times \text{Sales}_{it} \\ \text{FCORE(EBIT)}_{it} &= [(\text{OPM}_{i,t-4} + \text{OPM}_{i,t-8} + \text{OPM}_{i,t-12} + \text{OPM}_{i,t-16})/4] \\ &\quad \times \text{Sales}_{it} \\ \text{FCORE(GP)}_{it} &= [(\text{GPM}_{i,t-4} + \text{GPM}_{i,t-8} + \text{GPM}_{i,t-12} + \text{GPM}_{i,t-16})/4] \\ &\quad \times \text{Sales}_{it}.\end{aligned}$$

The non-core component of profit (FNCORE_{it}) is simply the difference between profit and the core component of profit:

$$\text{FNCORE(Profit)}_{it} = \text{Profit}_{it} - \text{FCORE(Profit)}_{it},$$

where $\text{Profit}_{it} = \{\text{NI}_{it}, \text{EBIT}_{it}, \text{GP}_{it}\}$.

The industry-based core component of profit, ICORE_{it}, is measured relative to industry profit margin, where industry affiliation is based on two-digit Standard Industrial Classification (SIC) codes.[4] We initially measure industry profit margin each quarter using all firms in the same industry. Then, we measure firm i's core profit by multiplying the industry profit margin by firm i's sales, as follows:

$$\text{ICORE(NI)}_{it} = \left[\frac{\sum_{k\in I(i)} \text{NI}_{kt}}{\sum_{k\in I(i)} \text{Sales}_{kt}}\right] \times \text{Sales}_{it}$$

$$\text{ICORE(EBIT)}_{it} = \left[\frac{\sum_{k\in I(i)} \text{EBIT}_{kt}}{\sum_{k\in I(i)} \text{Sales}_{kt}}\right] \times \text{Sales}_{it}$$

$$\text{ICORE(GP)}_{it} = \left[\frac{\sum_{k\in I(i)} \text{GP}_{kt}}{\sum_{k\in I(i)} \text{Sales}_{kt}}\right] \times \text{Sales}_{it},$$

where $I(i)$ is the set of firms that belong to the industry of firm i. Accordingly, the industry-based non-core component of profit is the difference between profit and

the industry-based core component of profit

$$\text{INCORE(Profit)}_{it} = \text{Profit}_{it} - \text{ICORE(Profit)}_{it},$$

where $\text{Profit}_{it} = \{\text{NI}_{it}, \text{EBIT}_{it}, \text{GP}_{it}\}$.

Next, we define ICE, which measures the proportion of earnings that is assumed to be sustainable, as the proportion of the absolute value of core income divided by the sum of the absolute values of the core and non-core components of income. We use absolute values to capture the magnitude of the deviation of actual profits from normal profit margins (rather than the sign of the deviation) because deviations from both sides mean lower precision.

We present two ICE measures, one based on firm-specific prior profit margins (FINT) and the second based on industry profit margins (IINT). They are, respectively:

$$\text{FINT(Profit)}_{it} = \frac{\left|\text{FCORE(Profit)}_{it}\right|}{\left|\text{FCORE(Profit)}_{it}\right| + \left|\text{FNCORE(Profit)}_{it}\right|},$$

$$\text{IINT(Profit)}_{it} = \frac{\left|\text{ICORE(Profit)}_{it}\right|}{\left|\text{ICORE(Profit)}_{it}\right| + \left|\text{INCORE(Profit)}_{it}\right|},$$

where $\text{Profit}_{it} = \{\text{NI}_{it}, \text{EBIT}_{it}, \text{GP}_{it}\}$.

3. Sample and Descriptive Statistics

The initial sample includes all observations with complete financial data on Compustat and stock returns on CRSP during the 1990–2009 period. We delete firms with market value of equity below $10 million at quarter-end to reduce the effect of small firms and firms in distress on our analysis. We also delete firm/quarter observations with missing quarterly data on market value of equity, book value of equity, sales and net income over the preceding four years, because the analysis requires past data. In addition, we exclude financial institutions (one-digit SIC = 6) and public utilities (two-digit SIC = 49) because these industries are subject to regulatory constraints. To limit the effect of outliers, each quarter we rank the sample according to the variables and remove the extreme top and bottom 1% of the observations. Finally, we remove firms with less than eight quarterly observations, and two-digit SIC industries in quarters with less than five active firms, because our two performance benchmarks are based on firm-specific past performance and industry-based performance, respectively. The analysts' earnings forecast sample includes all the observations in the full sample for which forecast data are available on the Institutional Brokers' Estimate System (I/B/E/S) database.[5] The full sample includes 103,998 usable firm/quarter observations for 3804 different firms. The analysts' earnings forecast

Table 1. Sample selection

Year	Full sample	Sample with analysts' earnings forecast data
1990	3148	1763
1991	3880	2279
1992	4242	2452
1993	4491	2738
1994	4612	2907
1995	4714	3012
1996	4955	3231
1997	5252	3611
1998	5229	3695
1999	5298	3731
2000	5480	3789
2001	5562	3733
2002	5737	3966
2003	6069	4433
2004	6192	4813
2005	6021	4693
2006	5701	4457
2007	5224	4127
2008	5988	4653
2009	6203	4815
Observations	103,998	72,898
Companies	3804	3336

Notes: The table presents the number of quarterly observations for each year in our sample. The initial sample includes all observations with complete financial data on Compustat and stock returns on CRSP, with market value of equity above $10 million at quarter-end. We exclude financial institutions (one-digit SIC = 6) and public utilities (two-digit SIC = 49). We also remove the extreme top and bottom 1% of the observations for each variable. In addition, we remove firms with less than eight quarterly observations and two-digit SIC industries in quarters with less than five active firms. The analysts' earnings forecast sample includes all observations in the full sample for which forecasts data are available on IBES.

sample includes 72,898 usable firm/quarter observations for 3336 different firms. Table 1 presents the number of quarterly observations for each year in our sample.

Table 2 presents descriptive statistics (panel A), selected correlations among the main variables (panel B), and correlations among the various ICE measures (panel C). Panel A presents descriptive statistics for the variables forming the ICE measures. In addition, this panel provides descriptive statistics for analysts' forecasts errors (FE), four measures of abnormal stock returns (AR), market value of equity (MV), and the book-to-market ratio (BM).

The first measure of abnormal stock return is the short-window, three-day excess buy-and-hold return around the preliminary quarterly earnings announcement date, denoted AR(SW). First, we compute the cumulative return on the security from one day before until one day after the preliminary quarterly earnings announcement. We then subtract the average three-day buy-and-hold return on a portfolio of

Table 2. Descriptive statistics and correlations

Panel A: Descriptive statistics (103,998 firm/quarter observations for all variables except FE, EBIT, and GP; for FE the number is 72,898; for EBIT it is 89,857; for GP it is 92,017)

Variable	Mean	Median	Std. dev.	25th pctl.	75th pctl.
Sales	415.64	102.23	1,057.66	32.00	331.84
NI	22.31	3.41	80.78	0.46	16.07
NPM	0.03	0.04	0.18	0.01	0.08
OPM	0.08	0.08	0.15	0.03	0.13
GPM	0.38	0.35	0.19	0.24	0.50
ABS(FCORE)	25.75	5.33	71.71	1.53	19.03
ABS(ICORE)	22.93	4.77	64.11	1.44	16.65
ABS(FNCORE)	14.68	2.92	42.45	0.84	10.74
ABS(INCORE)	16.13	3.63	45.35	1.05	12.44
FINT (NI)	0.61	0.64	0.26	0.42	0.83
IINT (NI)	0.57	0.59	0.25	0.39	0.76
FINT (EBIT)	0.69	0.74	0.24	0.53	0.88
IINT (EBIT)	0.65	0.66	0.20	0.52	0.81
FINT (GP)	0.89	0.93	0.11	0.86	0.97
IINT (GP)	0.75	0.76	0.15	0.65	0.88
FE	−0.00003	−0.00051	0.00598	−0.00051	0.00134
AR(SW)	0.00	0.00	0.07	−0.04	0.04
AR(LW)	0.00	0.00	0.12	−0.07	0.07
AR(PREFILE)	0.00	0.00	0.05	−0.02	0.02
AR(POSTFILE)	0.00	0.00	0.09	−0.05	0.04
MV	1890.74	368.28	5,336.81	99.99	1342.42
BM	0.62	0.51	0.44	0.32	0.79

Panel B: Pearson (above diagonal) and Spearman (below diagonal) correlations between selected variables (103,998 firm/quarter observations)

	NI	FINT(NI)	IINT(NI)	FCORE	ICORE	FNCORE	INCORE	MV	BM
NI		0.18	0.13	0.84	0.80	0.42	0.60	0.82	−0.17
FINT(NI)	0.39		0.23	0.21	0.12	−0.01	0.15	0.13	−0.16
IINT(NI)	0.37	0.21		0.08	0.17	0.11	−0.01	0.05	−0.08
FCORE	0.67	0.45	0.18		0.74	−0.15	0.41	0.81	−0.12
ICORE	0.69	0.19	0.34	0.62		0.22	0.01	0.72	−0.11
FNCORE	0.36	−0.10	0.16	−0.21	0.15		0.42	0.13	−0.10
INCORE	0.50	0.26	0.01	0.25	−0.06	0.32		0.41	−0.13
MV	0.72	0.21	0.11	0.68	0.77	0.14	0.18		−0.21
BM	−0.34	−0.16	−0.03	−0.20	−0.19	−0.25	−0.30	−0.47	

Panel C: Pearson (above diagonal) and Spearman (below diagonal) correlations between the intensity of core net income, the intensity of core EBIT, and the intensity of core gross profit (82,854 firm/quarter observations)

	FINT(NI)	IINT(NI)	FINT(EBIT)	IINT(EBIT)	FINT(GP)	IINT(GP)
FINT(NI)		0.23	0.65	0.18	0.25	0.05
IINT(NI)	0.21		0.21	0.65	0.14	0.22
FINT(EBIT)	0.65	0.19		0.29	0.36	0.09
IINT(EBIT)	0.17	0.64	0.27		0.17	0.31

(*Continued*)

Table 2. Continued

Panel C: Pearson (above diagonal) and Spearman (below diagonal) correlations between the intensity of core net income, the intensity of core EBIT, and the intensity of core gross profit (82,854 firm/quarter observations)

	FINT(NI)	IINT(NI)	FINT(EBIT)	IINT(EBIT)	FINT(GP)	IINT(GP)
FINT(GP)	0.26	0.11	0.36	0.13		0.07
IINT(GP)	0.05	0.21	0.08	0.28	0.02	

Notes: Variables are defined as follows (for firm i in quarter t):

- Sales: sales revenue (in millions of dollars);
- NI: net income (in millions of dollars);
- NPM: net profit margin, measured as NI divided by sales;
- OPM: operating profit margin, measured as EBIT divided by sales;
- GPM: gross profit margin, measured as gross profit divided by sales;
- ABS(FCORE): absolute value of firm-specific core net income (FCORE). FCORE is measured as the average NPM in the same quarter over the previous four years, multiplied by current sales: $\text{FCORE}_{it} = [(\text{NPM}_{i,t-4} + \text{NPM}_{i,t-8} + \text{NPM}_{i,t-12} + \text{NPM}_{i,t-16})/4] \times \text{Sales}_{it}$;
- ABS(FNCORE)$_{it}$: absolute value of firm-specific non-core net income (FNCORE);
- $\text{FNCORE} = \text{NI} - \text{FCORE}$;
- ABS(ICORE)$_{it}$: absolute value of industry-based core net income (ICORE), where industry is defined as a two-digit SIC code. For each quarter, we measure the average NPM in each industry. Then, we measure firm i's core earnings by multiplying the industry profit margin by firm i's sales. $\text{ICORE}_{it} = (\sum_{k\in I(i)} \text{NI}_{kt} / \sum_{k\in I(i)} \text{Sales}_{kt}) \times \text{Sales}_{it}$, where $I(i)$ is the set of all firms that belongs to the industry of firm i.
- ABS (INCORE): absolute value of industry-based non-core net income (INCORE), $\text{INCORE} = \text{NI} - \text{ICORE}$;
- FINT(NI): firm-specific intensity of core net income; $\text{FINT}_{it} = \text{ABS(FCORE)}_{it}/[\text{ABS(FCORE)}_{it} + \text{ABS(FNCORE)}_{it}]$;
- IINT(NI): industry-based intensity of core net income, $\text{IINT}_{it} = \text{ABS(ICORE)}_{it}/[\text{ABS(ICORE)}_{it} + \text{ABS(INCORE)}_{it}]$;
- FINT(EBIT) and IINT(EBIT): firm-specific and industry based intensity of core EBIT, measured in a manner similar to the intensity of net income;
- FINT(GP) and IINT(GP): firm-specific and industry based intensity of core gross profit, measured in a manner similar to the intensity of net income;
- FE: analysts' forecast error, measured as reported earnings per share minus mean consensus analysts' forecasts, deflated by the stock price at the end of the prior quarter.
- AR(SW): three-day excess buy-and-hold return around the preliminary earnings announcement date, calculated as the buy-and-hold return on the security minus the average buy-and-hold return on a portfolio of firms with similar size and BM;
- AR(LW): excess buy-and-hold return from one day before the preliminary earnings announcement until one day after the SEC filing;
- AR(PREFILE): excess buy-and-hold return from two days after preliminary announcement through one day after filing, calculated as the buy-and-hold return on the security minus the average buy-and-hold return on a portfolio of firms with similar size and BM;
- AR(POSTFILE): excess buy-and-hold return from two days after filing through one day after the next preliminary announcement if available, or plus 90 days if the next preliminary announcement is not available. Calculated as the buy-and-hold return on the security minus the average buy-and-hold return on a portfolio of firms with similar size and BM;
- BM: book-to-market ratio, measured as book value of common equity at quarter-end divided by market value of common equity;
- MV: market value of common equity at quarter-end (in millions of dollars).

firms with similar size and BM. We also compute post-announcement abnormal returns, as follows: AR(PREFILE) is the excess buy-and-hold return from two days after the preliminary quarterly earnings announcement through one day

after the 10-Q filing with the Securities and Exchange Commission (SEC); and AR(POSTFILE) is the excess buy-and-hold return from two days after the SEC filing through one day after the next preliminary announcement of quarterly earnings, if available, or plus 90 days if the next preliminary earnings announcement is unavailable. In addition, we compute excess buy-and-hold stock return from one day before the preliminary earnings announcement until one day after the filing of form 10-Q with the SEC, and denote it as AR(LW). We use this excess return measure to estimate the market reaction to the intensity of operating cash flows, as the accrual and cash flow components of quarterly earnings may not be available to investors in the three-day short window around the preliminary quarterly earnings announcement.

We measure analysts' forecast errors (FE) as quarterly earnings per share (as reported in IBES) minus mean analysts' forecasts (as reported in IBES), deflated by the stock price at the end of the previous quarter. We calculate book-to-market ratios (BM) as book value of equity at quarter-end divided by market value of common equity. We measure firm size (MV) as market value of common equity at quarter-end.

Results in panel A indicate that sales and net income (NI) are skewed to the right. The mean of net profit margin (NPM) is 0.03, smaller than the mean of EBIT margin (OPM), 0.08, which in turn is smaller than the mean of gross profit margin (GPM), 0.38. Furthermore, the standard deviations of profit margins relative to their mean (coefficient of variation) increases as we go down the income statement, suggesting that profit margins become more volatile and less predictable. The absolute core and non-core components of NI are also skewed to the right. Furthermore, the absolute core component of NI is larger than the absolute non-core component of NI for both the firm-specific and the industry-based measures.

The ICE increases, on average, as we go up the income statement. In particular, the firm-specific and industry-based mean intensities of core net income [FINT(NI) and IINT(NI)] are 0.61 and 0.57, respectively. The mean intensities of FINT(EBIT) and IINT(EBIT) are 0.69 and 0.65, respectively, while the mean intensities of core gross profit, FINT(GP) and IINT(GP), are 0.89 and 0.75, respectively. This result suggests that non-core items are more likely to affect EBIT and net income than gross profit, as one-time items and special items are often presented below gross profit. Also, the coefficient of variation (standard deviation divided by mean) of the intensity measures increases as we go down the income statement, suggesting that intensity measures become more volatile. Mean and median buy-and-hold abnormal returns for the contemporaneous and post-preliminary earnings announcement returns are zero, by construction. Market values (MV) and book-to-market ratios (BM) are also skewed to the right. Mean and median FE are close to zero, which is also consistent with the existing literature.

Panel B of Table 2 presents pair-wise Pearson (above the diagonal) and Spearman (below the diagonal) correlations among the main variables. The correlations between NI and its core and non-core components are positive;

however, the correlation between NI and its core component (FCORE or ICORE) is significantly larger (at the 0.01 level, not reported in the table) than that between NI and its non-core component (FNCORE or INCORE). Also, the correlations between firm-specific and industry-based core and non-core components are positive. For example, the Spearman correlation between FCORE and ICORE is 0.62 and between FNCORE and INCORE it is 0.32. Furthermore, the Spearman correlation between firm-specific intensity of core net income (FINT) and industry-based intensity of core net income (IINT) is surprisingly low, 0.21. These correlations suggest that firm-specific and industry-based profitability analyses are complementary to one another.

The correlations between the core and non-core components of net income are negative by construction; for instance, the Spearman correlation between FCORE and FNCORE is -0.21. In addition, larger firms tend to report more stable earnings, as reflected by the positive correlation between the intensity of core net income and market value of equity (the Spearman correlation between FINT and MV is 0.21). Finally, companies with larger book-to-market ratios have lower firm-specific intensity of core net income (the Spearman correlation between FINT and BM is -0.16). This result is interesting because it indicates that the ICE measure is significantly different than a measure of growth opportunities (captured by low book-to-market ratios).

Panel C of Table 2 presents correlations among the intensities of core NI, core EBIT, and core GP. The correlation between the intensity of core NI and core EBIT is relatively high (about 0.65) for both firm-specific and industry-based intensities. This result suggests that core and non-core items are likely to affect EBIT and NI in a similar way. Also, the correlations between the intensity of core net income and core gross profit, and between the intensity of core EBIT and core gross profit, are significantly lower; the Spearman correlation between FINT(NI) and FINT(GP) is 0.26, and between IINT(NI) and IINT(GP) it is 0.21; the Spearman correlation between FINT(EBIT) and FINT(GP) is 0.36, and between IINT(EBIT) and IINT(GP) it is 0.28. These correlations imply that transitory items that affect the intensity of core net income and core EBIT are unlikely to affect the intensity of gross profit, because non-core items are usually presented below gross profit.

Figure 1 presents average firm-specific and industry-based intensities of core net income [FINT(NI) and IINT(NI)] over the period (1990–2009). While average intensities are similar to one another (about 0.6), the firm-specific intensity is relatively stable over time, while the industry-based intensity is more volatile; it is in fact associated with the economy-wide declines that occurred in the early 1990s, 2001, and 2008. This is because firm-specific intensity is measured relatively to the preceding four years, therefore smoothing large economic shocks, whereas industry-based intensity is cross-sectional in nature.

Figure 2 presents average firm-specific intensities of core NI, core EBIT, and core GP over the sample period. The intensity of core net income [FINT(NI)] is lower than that of core EBIT, which in turn is lower than that of core gross profit.

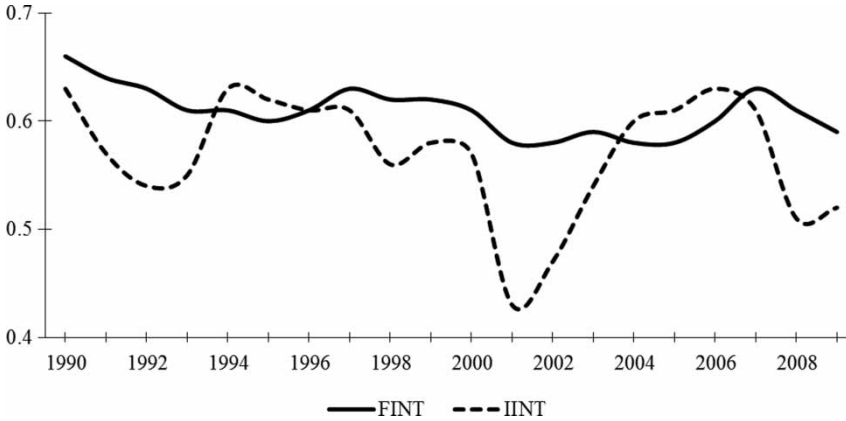

Figure 1. Firm-specific and industry-based intensities of core net income 1990–2009
The figure presents firm-specific intensity of core net income (FINT), and industry-based intensity of core net income (IINT) over 1990–2009.

- FINT_{it} is measured as $\text{ABS(FCORE)}_{it}/[\text{ABS(FCORE)}_{it} + \text{ABS(FNCORE)}_{it}]$;
- IINT_{it} is measured as $\text{ABS(ICORE)}_{it}/[\text{ABS(ICORE)}_{it} + \text{ABS(INCORE)}_{it}]$;
- ABS(FCORE) is the absolute value of firm-specific core net income (FCORE). FCORE is measured as the average NPM in the same quarter over the previous four years, multiplied by current sales: $\text{FCORE}_{it} = [(\text{NPM}_{i,t-4} + \text{NPM}_{i,t-8} + \text{NPM}_{i,t-12} + \text{NPM}_{i,t-16})/4] \times \text{Sales}_{it}$;
- ABS(FNCORE)_{it} is absolute value of firm-specific non-core net income (FNCORE), FNCORE = NI − FCORE;
- ABS(ICORE)_{it} is absolute value of industry-based core net income (ICORE), where industry is defined as a two-digit SIC code. For each quarter, we measure the average NPM in each industry. Then, we measure firm *i*'s core earnings by multiplying the industry profit margin by firm *i*'s sales. $\text{ICORE}_{it} = (\sum_{k\in I(i)} \text{NI}_{kt} / \sum_{k\in I(i)} \text{Sales}_{kt}) \times \text{Sales}_{it}$, where $I(i)$ is the set of all firms that belongs to the industry of firm *I*;
- ABS (INCORE) is absolute value of industry-based non-core net income (INCORE), INCORE = NI − ICORE.

Also, while the intensities of core net income and core EBIT declined over time, the intensity of core gross profit remained relatively stable over the entire sample period. Moreover, Figure 2 confirms that the intensity of core gross profit is largely unrelated to the intensities of both core net income and core EBIT.

4. Empirical Analysis

4.1 ICE and Earnings' Persistence

If deviations from normal profit margins assist in extracting sustainable earnings, we would expect the persistence of the core component of earnings, as measured here, to be larger than that of the non-core component. To estimate the persistence of the core and the non-core components of earnings, we use the average coefficients α_1 and α_2 obtained from the following regression models, which

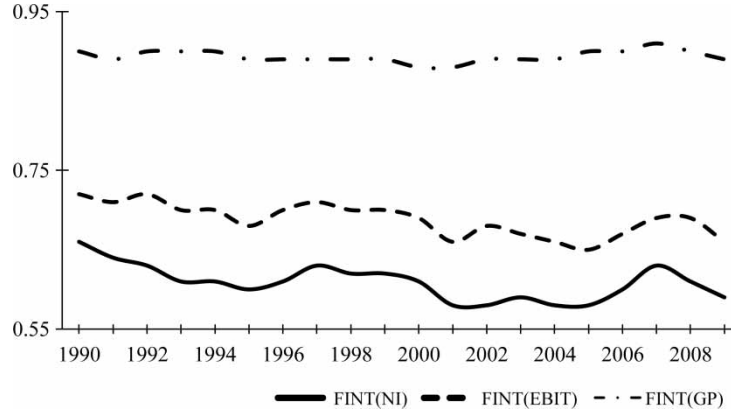

Figure 2. Firm-specific intensity of core net income, core EBIT and core gross profit over 1990–2009. See Figure 1 for details on the measurement of FINT(NI). FINT(EBIT) and FINT(GP) are firm-specific intensity of core EBIT and core gross profit, respectively, measured in a manner similar to that of net income.

are estimated on a quarter-by-quarter basis, as in Fama and MacBeth (1973):

$$\begin{aligned}\text{Profit}_{it} = {} & \alpha_{0t} + \alpha_{1t}\text{FCORE(Profit)}_{i,t-4} + \alpha_{2t}\text{FNCORE(Profit)}_{i,t-4} \\ & + \alpha_{3t}\text{CV(Profit)}_{i,t} + \alpha_{4t}\text{BM}_{i,t} + \alpha_{5t}\text{MV}_{i,t} + \varepsilon_{i,t}\end{aligned} \tag{1a}$$

$$\begin{aligned}\text{Profit}_{it} = {} & \alpha_{0t} + \alpha_{1t}\text{ICORE(Profit)}_{i,t-4} + \alpha_{2t}\text{INCORE(Profit)}_{i,t-4} \\ & + \alpha_{3t}\text{CV(Profit)}_{i,t} + \alpha_{4t}\text{BM}_{i,t} + \alpha_{5t}\text{MV}_{i,t} + \varepsilon_{i,t},\end{aligned} \tag{1b}$$

where $\text{Profit}_{it} = \{\text{NI}_{it}, \text{EBIT}_{it}, \text{and GP}_{it}\}$, and CV(profit)_{it} is the coefficient of variation of the corresponding profit measure at quarter t, measured as the standard deviation of profit divided by its mean over the last four quarters. We perform the analysis for the firm-specific core and non-core components of earnings in Regression 1(a), and for the industry-based core and non-core components of earnings in Regression 1(b).[6]

Results in Table 3 indicate that for all three profit measures (NI, EBIT, or GP) the persistence of core earnings, measured by α_1, is significantly larger than that of non-core earnings, measured by α_2. The difference in the average persistence coefficients is significant at the 0.01 level for both the firm-specific and the industry-based measures. That is, the deviations from normal profit margins assist in extracting sustainable earnings. Furthermore, the persistence of both the core and the non-core components of earnings increase as we go up the income statement. It is easier to predict gross profits than net income because larger proportions of earnings become less and less predictable as we go down the income statement.

Table 3. The persistence of core and non-core components of earnings

Model	Intercept	CORE (α_1)	NCORE (α_2)	CV (α_3)	BM (α_4)	MV (α_5)	Adj-R^2 (N)
Net income							
1a	0.31 (1.18)	0.49 (20.01)***	0.31 (17.12)***	0.04 (0.52)	−1.44 (−3.57)***	0.01 (20.84)***	0.77 (103,998)
1b	−0.34 (−1.24)	0.47 (16.44)***	0.29 (15.28)***	−0.12 (−1.86)*	−1.67 (−4.59)***	0.01 (23.46)***	0.77 (103,998)
EBIT							
1a	2.13 (9.82)***	0.84 (48.60)***	0.57 (21.71)***	0.15 (3.83)***	−2.64 (−9.54)***	0.01 (18.89)***	0.92 (89,857)
1b	1.49 (7.53)***	0.80 (40.68)***	0.65 (32.36)***	−0.04 (−0.73)	−2.29 (−8.32)***	0.01 (19.30)***	0.92 (89,857)
Gross profit							
1a	5.38 (8.35)***	0.96 (130.64)***	0.69 (23.32)***	0.89 (0.48)	−4.68 (−9.63)***	0.01 (23.57)***	0.97 (92,017)
1b	6.32 (8.24)***	0.95 (124.84)***	0.91 (88.72)***	−3.00 (−1.36)	−4.58 (−9.92)***	0.01 (25.37)***	0.97 (92,017)

Notes: The table presents the persistence of core and non-core components of net income, EBIT, and gross profit. We estimate regression models (1a) and (1b), and present average coefficients and *t*-statistics (in brackets) as in Fama and MacBeth (1973). See Table 2 for definitions of variables.
***Significance from zero at the 0.01 level.
**Significance from zero at the 0.05 level.
*Significance from zero at the 0.10 level.

Next, we focus on the association between the ICE and the persistence of earnings. For each quarter, we sort all firms according to their ICE measures (FINT and IINT) in quarter $t - 4$. Then, we assign each firm-quarter to quintile portfolios based on the ICE in quarter $t - 4$. We estimate Equation (2) in each quarter for each of the five quintile portfolios and present the earnings persistence coefficient (γ_1) in Table 4.

$$\text{Profit}_{it} = \gamma_{01t} + \gamma_{1t}\text{Profit}_{it-4} + \gamma_{2t}\text{CV(Profit)}_{it} + \gamma_{3t}\text{BM}_{it} + \gamma_{4t}\text{MV}_{it} + \psi_{it}, \quad (2)$$

where $\text{Profit}_{it} = \{\text{NI}_{it}, \text{EBIT}_{it}, \text{and GP}_{it}\}$.

Results in Table 4 indicate that the average persistence coefficient, γ_1, increases monotonically with the intensity quintile for both firm-specific and industry-based measures of core intensity. The difference in γ_1 between the lower and higher quintiles is significant at the 0.01 level for the three profit measures (NI, EBIT, and GP). Also, less comprehensive measures of earnings are more persistent: for the entire sample, γ_1 is 0.36 for net income, 0.76 for EBIT, and 0.95 for gross profit.

In addition, the impact of the ICE on earnings persistence diminishes as we go up the income statement (profit measures become less comprehensive): For both firm-specific and industry-based intensities, the difference in γ_1 between the bottom and upper quintiles of the intensity of core net income is larger than

Table 4. The effect of core intensity on the persistence of earnings

Quintiles based on core intensity in $t - 4$	Average persistence coefficient (γ_1)					
	FINT_{t-4} (firm-based intensity)			IINT_{t-4} (industry-based intensity)		
	NI	EBIT	GP	NI	EBIT	GP
All	0.36***	0.76***	0.95***	0.36***	0.76***	0.95***
1	0.14***	0.46***	0.82***	0.17***	0.63***	0.91***
2	0.38***	0.67***	0.92***	0.43***	0.76***	0.94***
3	0.57***	0.81***	0.97***	0.53***	0.78***	0.94***
4	0.64***	0.86***	0.98***	0.59***	0.77***	0.96***
5	0.73***	0.89***	0.97***	0.59***	0.79***	0.95***
5 − 1	0.59***	0.43***	0.15***	0.42***	0.16***	0.04**

Notes: The table presents average persistence coefficients (γ_1) obtained from estimating regression model (2), each quarter, for five quintiles. Quintiles are formed according to the core earnings intensity (firm-based and industry-based) in the same quarter last year ($t - 4$). For each quarter, we sorted all observations according to their FINT or IINT and assigned the sample observations to quintiles. See Table 2 for definitions of variables. The model is:
$\text{Profit}_{it} = \gamma_{01t} + \gamma_{1t}\text{Profit}_{it-4} + \gamma_{2t}\text{CV(Profit)}_{it} + \gamma_{3t}\text{BM}_{it} + \gamma_{4t}\text{MV}_{it} + \psi_{it}$,
where Profit = {NI, EBIT, and Gross profit}.
***Significance from zero at the 0.01 level.
**Significance from zero at the 0.05 level.
*Significance from zero at the 0.10 level.

the difference in γ_1 between the bottom and upper quintiles of the intensity of core EBIT, which in turn is larger than the difference in γ_1 between the bottom and upper quintiles of the intensity of gross profit (all differences are significant at the 0.01 level).

Overall, the evidence in Tables 3 and 4 suggests a positive association between earnings persistence and the ICE, which we view as validation of our earnings quality measure. These results are also consistent with the view that analysing deviations from normal profit margins is a useful method for extracting information on sustainable earnings. Furthermore, the importance of the ICE increases as we go down the income statement, because the persistence of the non-core component of earnings decreases, but its relative magnitude increases.

4.2 ICE and the Predictability of Earnings

A useful measure of sustainable earnings should be associated with improved earnings predictability, and, in particular, the quality of analysts' earnings forecasts. We therefore examine the association between the ICE in period $t - 4$ (a year before the forecasts) and three analysts' earnings forecast attributes: (1) forecast accuracy in quarter t, measured as the absolute value of the average forecast error; (2) forecast dispersion in quarter t, measured as the standard deviation of forecasts, deflated by the stock price at the end of the previous quarter; and (3) forecast bias in quarter t, measured as the average forecast error. Consistent with prior studies, we compute forecast errors for firm i in quarter t (FE_{it}) as the IBES actual net income per share minus average analysts' forecasts announced in the month immediately preceding that of the earnings announcement (as reported in IBES), deflated by the stock price at the end of the previous quarter. We expect the ICE to be negatively associated with the absolute value of forecast errors (higher accuracy) and with the standard deviation of forecasts (less dispersed forecasts).

To test our prediction regarding the positive association between the ICE and the quality of analysts' earnings forecasts, we form quintile portfolios according to the intensity of core net income [FINT(NI) and IINT(NI)] and the intensity of core EBIT [FINT(EBIT) and IINT(EBIT)].[7] Specifically, in each quarter, we sort all observations according to their intensity in quarter $t - 4$ and assign the firm into quintiles. Then, for each quintile, we measure mean analysts' forecast accuracy, mean forecast dispersion, and mean forecast bias. Note that the ICE is determined in quarter $t - 4$, whereas forecast attributes are measured in quarter t (a year later). Table 5 presents, for each intensity quintile, mean analysts' forecast accuracy, mean forecast dispersion, and mean forecast bias in quarter t (we multiply accuracy, dispersion, and bias values by 1000). In addition, for each quintile, we compute the percentage of loss-reporting firms in quarter t. Panel A provides results for quintiles formed based on FINT(NI). Panel B provides results for quintiles formed based on IINT(NI). Panel C provides results

Table 5. The ICE and analysts' earnings predictions

Panel A: Firm-specific intensity of core net income in period $t - 4$

Quintiles based on FINT(NI) in $t - 4$	Accuracy in period t ABS(FE_t)	Dispersion in period t STD(forecasts)$_t$	Bias in period t FE_t	Percentage of loss firms in period t ($NI_t < 0$)	
				Full sample	$NI_{t-4} > 0$
N	72,898	54,125	72,898	103,998	85,985
All	2.57***	1.19***	−0.03	18.01%	11.26%
1	3.40***	1.63***	−0.14**	26.37%	15.24%
2	3.15***	1.43***	−0.09	24.04%	17.28%
3	2.55***	1.14***	−0.03	19.46%	10.34%
4	2.04***	0.93***	0.03	11.65%	7.45%
5	1.68***	0.81***	0.06*	8.49%	5.97%
5 − 1	−1.72***	−0.82***	0.20***	−17.88%	−9.27%

Panel B: Industry-based intensity of core net income in period $t - 4$

Quintiles based on IINT(NI) in $t - 4$	Accuracy in period t ABS (FE_t)	Dispersion in period t STD(forecasts)$_t$	Bias in period t FE_t	Percentage of loss firms in period t ($NI_t < 0$)	
				Full sample	$NI_{t-4} > 0$
N	72,898	54,125	72,898	103,998	85,985
All	2.57***	1.19***	−0.03	18.01%	11.26%
1	3.01***	1.44***	−0.03	32.46%	9.88%
2	2.73***	1.25***	−0.10*	21.07%	14.54%
3	2.52***	1.15***	−0.05	14.99%	12.55%
4	2.37***	1.07***	−0.02	11.30%	9.78%
5	2.20***	1.03***	0.00	10.21%	9.56%
5 − 1	−0.81***	−0.41***	0.03	−22.25%	−0.32%

Panel C: Firm-specific intensity of core EBIT in period $t - 4$

Quintiles based on FINT(EBIT) in $t - 4$	Accuracy in period t ABS(FE_t)	Dispersion in period t STD(forecasts)$_t$	Bias in period t FE_t	Percentage of negative EBIT in period t ($EBIT_t < 0$)	
				Full sample	$EBIT_{t-4} > 0$
N	63,395	47,215	63,395	89,857	78,841
All	2.55***	1.17***	−0.02	12.71%	6.76%
1	3.68***	1.70***	−0.29***	25.27%	13.86%
2	2.99***	1.34***	0.02	19.57%	9.52%
3	2.37***	1.09***	0.04	9.40%	4.69%
4	2.00***	0.89***	0.09*	5.27%	3.11%
5	1.71***	0.80***	0.08**	4.01%	2.57%
5 − 1	−1.97***	−0.90***	0.37***	−8.70%	−11.29%

Panel D: Industry-based intensity of core EBIT in period $t - 4$

Quintiles based on IINT(EBIT) in $t - 4$	Accuracy in period t ABS(FE_t)	Dispersion in period t STD(forecasts)$_t$	Bias in period t FE_t	Percentage of negative EBIT in period t ($EBIT_t < 0$)	
				Full sample	$EBIT_{t-4} > 0$
N	63,395	47,215	63,395	89,857	78,841
All	2.55***	1.17***	−0.02	12.71%	6.76%
1	3.11***	1.38***	−0.25***	32.67%	8.56%
2	2.78***	1.28***	−0.05	14.02%	9.89%
3	2.49***	1.10***	0.02	7.45%	6.43%
4	2.27***	1.05***	0.05	5.20%	4.90%
5	2.11***	1.01***	0.16***	4.21%	4.00%
5 − 1	−1.00***	−0.37***	0.41***	−8.50%	−4.56%

Notes: The table presents mean forecast accuracy (absolute forecast error), mean forecast dispersion (standard deviation of forecasts, deflated by the stock price at the end of the prior period), mean forecast bias (forecast error), and percentage of loss-reporting firms in period t. Forecast attributes are multiplied by 1000. Quintile formation is according to the ICE in the same quarter last year ($t - 4$). Panel A presents results for firm-specific intensity of core net income; panel B presents results for industry-based intensity of core net income; panel C presents results for firm-specific intensity of core EBIT; and panel D presents results for industry-based intensity of core EBIT. See Table 2 for definitions of variables.

***Significance from zero at the 0.01 level.

**Significance from zero at the 0.05 level.

*Significance from zero at the 0.10 level.

for quintiles formed based FINT(EBIT), and lastly, Panel D provides results for quintiles formed based on IINT(EBIT).

Focusing on Panels A and B, there is monotonic decrease in mean absolute forecast errors [ABS(FE)] as we proceed up the intensity quintiles. The difference in ABS(FE) between the bottom and upper quintiles is 1.72 and 0.81 for FINT(NI) and IINT(NI), respectively (significantly different from zero at the 0.01 level). This evidence suggests a positive association between the intensity of core net income and the accuracy of subsequent earnings forecasts. We also observe a monotonic decline in forecast dispersion as we proceed up the intensity quintiles. The difference in forecast dispersion between the extreme intensity quintiles is 0.82 and 0.41 for FINT(NI) and IINT(NI), respectively (significant at the 0.01 level).

Turning to bias in analysts' earnings forecast (FE), we find (Panel A) a monotonic increase in mean forecast errors as we proceed up the FINT(NI) quintiles. Specifically, the mean forecast error is -0.14 (significantly different from zero at the 0.05 level) in the bottom quintile, and it is $+0.06$ in the upper quintile (significantly different from zero at the 0.10 level). The difference in FE between these extreme quintiles is 0.20, which is significant at the 0.01 level. This result suggests that financial analysts tend to be optimistic in their earnings forecasts when the intensity of core net income is low, but rather pessimistic when it is high. Since the ICE is positively associated with earnings persistence, the implication is that analysts' bias is associated with their misperception of earnings' persistence. However, no such bias is apparent for industry-based intensity of net income [IINT(NI)].

We also examine whether the ICE in quarter $t - 4$ is associated with the probability of losses in the current quarter. Specifically, we present the information for the entire sample and for those companies that reported positive earnings in quarter $t - 4$ (that is, $\text{Profit}_{t-4} > 0$). Focusing on Panels A and B, for the full sample, both panels indicate a monotonic decrease in the percentage of loss-reporting firms in quarter t, as we proceed up the intensity quintiles. Specifically, the percentage of loss-reporting firms in the bottom quintile of FINT(NI) [IINT(NI)] is 26% (32%), whereas the percentage of loss-reporting firms in the upper quintile of FINT(NI) [IINT(NI)] is only 8% (10%). As for the subsample of firms with reported profits in quarter $t - 4$, the monotonic decline in the frequency of losses holds only for the firm-specific intensity measure; it is less apparent for the industry-based intensity.[8]

Next we analyse the association between the intensity of core EBIT and analysts' forecast attributes (Panels C and D). Similarly to the analysis of the intensity of net income, we find a positive association between the current intensity of core EBIT and the accuracy of subsequent earnings forecasts, and a negative association between the current intensity of core EBIT and subsequent forecast dispersion. Furthermore, analysts' bias (FE) in period t is also associated with the intensity of core EBIT in period $t - 4$. We find a monotonic increase in mean forecast errors as we proceed up the intensity quintiles for both

FINT(EBIT) and IINT(EBIT). Overall, the results in Panels C and D for the intensity of core EBIT are similar to those obtained in Panels A and B for the intensity of core net income. This suggests that our results are robust to the exclusion of special and extraordinary items, which are presented below operating income.

Overall, the evidence in Table 5 suggests a strong association between the ICE and forecast attributes, suggesting that the ICE is positively associated with improved earnings predictability. Specifically, higher ICE in quarter $t - 4$ is associated with more accurate forecasts, less dispersed forecasts, and less optimistic forecasts in quarter t. This association could be related to the frequency of losses, as firms with a higher ICE in quarter $t - 4$ are less likely to report losses in quarter t.[9]

4.3 Contemporaneous Market Reaction to Earnings and the ICE

The evidence thus far suggests that the intensity of core net income and the intensity of core EBIT are associated with larger earnings persistence and improved earnings predictability. Another useful measure of earnings quality is the market reaction to unexpected earnings. To examine whether higher ICE is indeed associated with a stronger market reaction to quarterly earnings announcements, we estimate Equation (3) each quarter and present average coefficients:

$$\mathrm{AR(SW)}_{it} = \delta_{0t} + \delta_{1t} D_{it} + \delta_{2t} \mathrm{FE}_{it} + \delta_{3t} D_{it} \times \mathrm{FE}_{it} + \eta_{it} \tag{3}$$

The dependent variable, $\mathrm{AR(SW)}_{it}$, is the three-day excess buy-and-hold return around firm i's preliminary earnings announcement date in quarter t (calculated as the buy-and-hold return on the security minus the average buy-and-hold return on a portfolio of firms with similar size and BM). The explanatory variables are unexpected earnings, measured as analysts' net income forecast error (FE_{it}), and an indicator variable D_{it} that obtains the value of '1' if the intensity of core net income [FINT(NI) and IINT(NI)] or core EBIT [FINT(EBIT) and IINT(EBIT)] is above the quarterly median, and '0' otherwise. Once again, we also investigate whether core earnings intensity of EBIT is associated with the market reaction to analysts' forecast error, to exclude the effect of transitory line items on our analysis. We expect δ_3 to be positive if a positive association exists between the ICE and the market reaction to the announcements of unexpected quarterly earnings. In addition, we assign firms each quarter to quintiles formed based on the intensity of core net income and core EBIT in quarter t, and estimate a reduced form of Equation (3): $\mathrm{AR(SW)}_{it} = \lambda_{0t} + \lambda_{1t} \mathrm{FE}_{it} + \eta_{it}$. We expect the earnings response coefficient (λ_1) to increase with the ICE.

Panel A of Table 6 presents average coefficients and corresponding t-statistics for Equation (3). The first specification excludes the intensity indicator variable, and we present it as a benchmark. The average earnings response coefficient for

Table 6. The ICE and the market reaction to earnings

Panel A: Full sample regression analysis

Specification		Intercept	D	FE	$D \times$ FE	Adj-R^2 (N)
1		0.01 (9.18)***		3.60 (16.84)***		0.05 (72,898)
Net income						
2	FINT	0.01 (6.40)***	−0.00 (−0.25)	3.21 (15.59)***	1.73 (9.49)***	0.05 (72,898)
3	IINT	0.01 (6.35)***	0.00 (0.13)	2.90 (14.96)***	2.51 (12.08)***	0.06 (72,898)
EBIT						
4	FINT	0.01 (5.97)***	0.00 (0.11)	3.35 (16.57)***	1.75 (9.53)***	0.06 (63,395)
5	IINT	0.01 (4.83)***	0.00 (2.55)**	3.11 (16.77)***	2.21 (9.53)***	0.06 (63,395)

Panel B: Regression analysis over quintiles

	Intensity of core net income		Intensity of core EBIT	
	Average market reaction coefficient (λ_1)		Average market reaction coefficient (λ_1)	
Quintiles based on intensity in period t	FINT(NI)$_t$	IINT(NI)$_t$	FINT(EBIT)$_t$	IINT(EBIT)$_t$
Average N	14,580	14,580	12,679	12,679
All	3.60***	3.60***	3.72***	3.72***
1	2.82***	2.41***	2.93***	2.57***
2	3.49***	3.28***	3.90***	3.90***
3	4.61***	4.84***	4.76***	4.50***
4	5.38***	5.69***	5.28***	5.39***
5	6.10***	5.58***	5.65***	5.81***
5 − 1	3.28***	3.17***	2.72***	3.24***

Notes: In panel A of the table, we estimate regression model (3) each quarter using the full sample, and present average coefficients and t-statistics as in Fama and MacBeth (1973). D_{it} is an indicator variable that equals '1' if the intensity of core net income (or core EBIT) for firm i, measured either as firm-specific (FINT) or industry based (IINT), is above the quarterly median at time t, and '0' otherwise. In panel B, we estimate the model: $\mathrm{AR(SW)}_{it} = \lambda_{0t} + \lambda_{1t}\,\mathrm{FE}_{it} + \eta_{it}$, each quarter, for five quintiles, and present average coefficients. Quintiles are formed according to the intensity of core net income (left panel) and the intensity of core EBIT (right panel). We sort all observations according to their intensity (both firm-specific and industry-based) and assign them to quintiles.

***Significance from zero at the 0.01 level.

**Significance from zero at the 0.05 level.

*Significance from zero at the 0.10 level.

that specification (δ_2) is 3.60 (significant at the 0.01 level). Focusing on the second specification, when the intensity of firm-specific core net income is below the median, the earnings response coefficient is 3.21 (significantly larger than zero at the 0.01 level); this coefficient increases by 1.73 (significant at the 0.01 level) when the firm-specific intensity is above the quarterly median. Similarly, when the industry-based intensity of core net income is below the quarterly median (specification 3), the earnings response coefficient is 2.90, increasing by 2.51 (significant at the 0.01 level) when the industry-based intensity of core net income is above the quarter median. Turning to the intensity of core EBIT (specifications 4 and 5), the earnings response coefficient increases by 1.75 and 2.21 for FINT(EBIT) and IINT(EBIT), respectively (both are significant at the 0.01 level).

The quintile analysis in Panel B suggests a monotonic increase in earnings response coefficients as the ICE increases, for both intensity of core net income (left side of the panel) and core EBIT (right side of the panel). Specifically, the coefficient λ_1 increases monotonically with the intensity quintiles. The difference in λ_1 between the bottom and the upper quintiles of core intensity of net income is 3.28 and 3.17 for FINT(NI) and IINT(NI), respectively (significantly different from zero at the 0.01 level). As for the intensity of core EBIT, the difference in λ_1 between the bottom and upper quintiles is 2.72 and 3.24 for FINT(EBIT) and IINT(EBIT), respectively (significantly different from zero at the 0.01 level).[10]

The evidence provided in Table 6 suggests that the ICE measures based on net income and EBIT are useful in explaining the contemporaneous market reaction to unexpected quarterly earnings. In particular, the earnings response coefficient, which is an important attribute of earnings quality, increases with the ICE. This result provides additional validation to the ICE as a measure of sustainable earnings.

4.4 Post-Earnings Announcement Drift and the ICE

The evidence in Section 4.2 suggests that the bias in analysts' earnings forecast is associated with the ICE. An obvious question that arises is whether the ICE is fully reflected in stock prices. Moreover, the post-earnings announcement drift is often attributed to incorrect estimation of earnings persistence (Bernard and Thomas, 1989, 1990; Chan et al., 1996), which is linked to our measure. We, therefore, examine whether the ICE is associated with post-earnings announcement stock returns. We use two return windows: the first one, denoted as AR(PREFILE), starts two days after the preliminary quarterly earnings announcement and ends one day after the filing of the 10-Q firm with the SEC; and the second one, denoted as AR(POSTFILE), starts two days after the SEC filing and ends one day after the subsequent preliminary quarterly earnings announcement, if available, or otherwise plus 90 days. Specifically, we estimate

two regression models as follows:

$$\text{AR(PREFILE)}_{it} = \kappa_{0t} + \kappa_{1t} D_{it} + \kappa_{2t} \text{FE}_{it} + \kappa_{3t} D_{it} \times \text{FE}_{it} + \eta_{it} \quad (4a)$$

$$\text{AR(POSTFILE)}_{it} = \kappa_{0t} + \kappa_{1t} D_{it} + \kappa_{2t} \text{FE}_{it} + \kappa_{3t} D_{it} \times \text{FE}_{it} + \eta_{it} \quad (5a)$$

The dependent variables are excess buy-and-hold stock returns for the post-preliminary announcement windows, and all other variables are as described in the previous section. If the market does not fully incorporate the ICE into stock prices, the coefficients κ_3 will be different from zero.

Table 7 presents the results of our post-earnings announcement drift analysis. For the benchmark specifications (1 and 2), the coefficient κ_2 is 0.914 and 0.617 for the PREFILE and POSTFILE windows, respectively (significantly different from zero at the 0.01 level). This result is consistent with existence of a positive drift in our sample, consistent with evidence in previous studies.

Specifications 3–6 suggest a stronger post-earnings announcement drift for companies with above-median intensity of core net income. Specifically, the coefficient κ_3 is significantly positive (0.372) at the 0.05 level for the PREFILE window when the ICE is measured relative to firm-specific profit margins [FINT(NI)]; this coefficient is significantly positive (0.313) at the 0.10 level for the POSTFILE window. We obtain similar results for industry-based intensity of core net income [IINT(NI)]: Companies with above-median industry-based intensity have larger drifts, as reflected by the significantly positive coefficients κ_3(0.433 and 0.352 in specifications 4 and 6, respectively). We repeat the analysis for the intensity of core EBIT (specifications 7–10). In general, the drift is stronger for companies with above-median intensities, but the results are significant at the 0.10 level only in specification 8 – PREFILE window for industry-based intensity.[11]

We also form quintiles each quarter according to the intensity of core net income and core EBIT, and estimate the following equations for each quintile using the post-preliminary earnings announcement windows as the dependent variables:

$$\text{AR(PREFILE)}_{it} = \nu_{0t} + \nu_{1t} \text{FE}_{it} + \eta_{it} \quad (4b)$$

$$\text{AR(POSTFILE)}_{it} = \nu_{0t} + \nu_{1t} \text{FE}_{it} + \eta_{it} \quad (5b)$$

Panels A and B of Table 8 report the coefficients ν_1 for quintiles formed based on the intensity of core net income and core EBIT, respectively. Results in Panel A, for the intensity of core net income suggest that for both windows (PREFILE and POSTFILE), and for both FINT(NI) and IINT(NI), ν_1 increases almost monotonically as we proceed up the intensity quintiles (with the exception of moving from quintile 4 to quintile 5). The difference in ν_1 between the bottom and the

Table 7. ICE and the post-earnings announcement drift regression analysis

Dependent variable	Specification		Intercept	D	FE	$D \times$ FE	Adj-R^2 (N)
AR (PREFILE)	1		0.001 (0.64)		0.914 (11.05)***		0.003 (72,898)
AR(POSTFILE)	2		0.001 (1.01)		0.617 (7.36)***		0.002 (72,898)
Net Income							
AR (PREFILE)	3	FINT	−0.001 (−0.47)	0.002 (2.24)**	0.804 (8.35)***	0.372 (2.10)**	0.004 (72,898)
AR (PREFILE)	4	IINT	0.000 (0.43)	0.000 (0.12)	0.758 (9.10)***	0.433 (2.38)**	0.004 (72,898)
AR(POSTFILE)	5	FINT	−0.000 (−0.02)	0.002 (1.83)*	0.522 (5.67)***	0.313 (1.77)*	0.003 (72,898)
AR(POSTFILE)	6	IINT	0.001 (1.03)	−0.000 (−0.63)	0.492 (5.46)***	0.352 (2.07)**	0.003 (72,898)
EBIT							
AR (PREFILE)	7	FINT	−0.000 (−0.36)	0.002 (1.62)	0.874 (8.19)***	0.201 (0.98)	0.004 (63,395)
AR (PREFILE)	8	IINT	0.000 (0.14)	0.000 (0.24)	0.776 (7.28)***	0.384 (1.87)*	0.004 (63,395)
AR(POSTFILE)	9	FINT	0.000 (0.09)	0.001 (1.09)	0.580 (5.76)**	0.207 (1.06)	0.003 (63,395)
AR(POSTFILE)	10	IINT	0.001 (0.60)	−0.000 (−0.24)	0.526 (5.00)***	0.257 (1.36)	0.002 (63,395)

Notes: The table presents results for the effect of the intensity of core net income and core EBIT on post-announcement stock returns. Post-announcement returns are measured in two ways: AR(PRFILE) is excess buy-and-hold return from two days after preliminary earnings announcement through one day after filing. AR(POSTFILE) is excess buy-and-hold return from two days after filing through one day after the next preliminary announcement, if available, or plus 90 days if the next preliminary announcement is not available. We estimate regression models (4a) and (5a) in the full sample, and present average coefficients and t-statistics as in Fama and MacBeth (1973). D_{it} is an indicator variable that equals '1' if the intensity of core net income (or core EBIT) for firm i, measured either as firm-specific (FINT) or industry based (IINT), is above the quarterly median at time t, and '0' otherwise. See Table 2 for definitions of other variables.

***Significance from zero at the 0.01 level.

**Significance from zero at the 0.05 level.

*Significance from zero at the 0.10 level.

Table 8. ICE and the post-earnings announcement drift

Panel A: Quintile regressions for the intensity of core net income

	Average post-earnings announcement drift coefficient (ν_1)			
	AR(PREFILE)		AR(POSTFILE)	
Quintiles based on intensity in period t Average $N = 14{,}580$	FINT(NI)	IINT(NI)	FINT(NI)	IINT(NI)
All	0.91***	0.91***	0.62***	0.62***
1	0.68***	0.78***	0.43***	0.50***
2	0.96***	0.82***	0.69***	0.55***
3	1.20***	0.97***	0.80***	0.68***
4	1.40***	1.24***	1.17***	0.88***
5	1.37***	1.16***	0.93***	0.92***
5 − 1	0.65**	0.39	0.51	0.42

Panel B: Quintile regressions for the intensity of core EBIT

	Average post-earnings announcement drift coefficient (ν_1)			
	AR(PREFILE)		AR(POSTFILE)	
Quintiles based on intensity in period t Average $N = 12{,}679$	FINT(EBIT)	IINT(EBIT)	FINT(EBIT)	IINT(EBIT)
All	0.93***	0.93***	0.63***	0.63***
1	0.90***	0.69***	0.61***	0.51***
2	0.79***	0.86***	0.51***	0.54***
3	1.19***	1.11***	0.75***	0.74***
4	0.69***	1.16***	0.47*	0.80***
5	1.49***	1.23***	1.11***	0.90***
5 − 1	0.59	0.54*	0.50	0.39

Notes: The table presents average slope coefficients obtained from estimating regression models (4b) and (5b), each quarter, for five quintiles. Quintiles are formed according to the intensity of core net income (panel A) and the intensity of core EBIT (panel B). We sort all observation according to their FINT or IINT and assign them to quintiles. AR(PRFILE) is excess buy-and-hold return from two days after preliminary announcement through one day after filing. AR(POSTFILE) is excess buy-and-hold return from two days after filing through one day after the next preliminary announcement if available or plus 90 days if the next preliminary announcement is not available. See Table 2 for definitions of other variables.

***Significance from zero at the 0.01 level.

**Significance from zero at the 0.05 level.

*Significance from zero at the 0.10 level.

upper quintiles is positive in all four cases, but significant at the 0.05 level only for quintiles assigned according to FINT(NI) in the PREFILE window. Results in Panel B, for the intensity of core EBIT, indicate that for both windows (PREFILE and POSTFILE) ν_1 increases monotonically as we go up to a higher intensity quintile only for the industry-based intensity. The difference in ν_1 between the bottom and upper quintiles of core intensity is positive in all four cases, but it is significant at the 0.10 level only for quintiles formed based on IINT(EBIT) for the PREFILE window.

To summarise, the results in Tables 7 and 8 suggest that the ICE is positively associated with the magnitude of the post-earnings announcement drift. In particular, the drift is significantly larger for firms with above-median intensity of net income, consistent with the argument that the market does not fully price the effect of the ICE on earnings persistence. This evidence is also consistent with our analysts' forecast findings that earnings forecasts tend to be optimistic for firms with low intensity, and pessimistic for firms with high intensity.

4.5 The Interaction between the ICE and the Intensity of Operating Cash Flows

While our proposed intensity measure is based on accrual accounting, a natural alternative would be to compute the intensity of CFO. In particular, earnings are considered to be of higher quality when the intensity of the CFO component of earnings is larger. Sloan (1996) finds that the accrual and cash flow components of earnings have differential persistence, and that a larger CFO component of earnings increases its overall persistence (that is, there is a positive association between the intensity of CFO and earnings quality). To compare our proposed earnings quality measure to a cash-based intensity measure, we compute the intensity of current CFO. In addition we compute the intensity of core CFO based on deviations from average CFO-to-sales ratios.

The intensity of current CFO (CFOINT) is computed in a way similar to Sloan (1996):

(1) $\text{Accruals}_{it} = \text{NI}_{it} - \text{CFO}_{it}$
(2) $\text{Accrual component}_{it} = \text{Accruals}_{it}/\text{Average total assets}_{it}$,
(3) $\text{CFO component}_{it} = \text{CFO}_{it}/\text{Average total assets}_{it}$,

$$\text{CFOINT}_{it} = \frac{\left|\text{CFO component}_{it}\right|}{\left|\text{CFO component}_{it}\right| + \left|\text{Accrual component}_{it}\right|}.$$

We also compute the intensity of core CFO (Core CFOINT) in a manner similar to that applied for profit margins. First, we compute the cash-to-sales ratios (CS), $\text{CS}_{ik} = \text{CFO}_{it}/\text{Sales}_{it}$. Then we compute the firm-specific core

CFO_{it} [FCORE(CFO)$_{it}$] as FCORE(CFO)$_{it}$ = [($\text{CS}_{i,t-4}$ + $\text{CS}_{i,t-8}$ + $\text{CS}_{i,t-12}$ + $\text{CS}_{i,t\ -\ 16}$)/4] × Sales_{it}, and industry-based core CFO_{it} [ICORE(CFO)$_{it}$] as $\text{ICORE(CFO)}_{it} = \left[\sum_{k\in I(i)} \text{CFO}_{kt} / \sum_{k\in I(i)} \text{Sales}_{kt}\right] \times \text{Sales}_{it}$, where $I(i)$ is the set of all firms that belong to the industry of firm i. We compute the core component of accruals (Core accrual) as net income minus the core component of cash flows.

$$\text{Core CFOINT}_{it} = \frac{|\text{Core CFO}_{it}|}{|\text{Core CFO}_{it}| + |\text{Core accrual}_{it}|}.$$

To analyse the interaction between the intensity of core net income and the intensity of CFO, we define two indicator variables as follows: the first is D_{it}^{NPM} – an indicator variable coded '1' if the intensity of core net income for firm i is above the quarterly median at time t, and '0' otherwise; the second is D_{it}^{CFO} – an indicator variable coded '1' if the intensity of CFO for firm i is above the median in year t, and '0' otherwise. We conduct our analysis for both current cash flows intensity (CFOINT) and core cash flows intensity (CoreCFOINT$_{it}$).[12] We begin with estimating equation (6), allowing the coefficients on NI_{t-4} to interact with $D_{i,t-4}^{\text{NPM}}$ and $D_{i,t-4}^{\text{CFO}}$.

$$\begin{aligned}\text{NI}_{it} = {} & \beta_{0t} + \beta_{1t} D_{i,t-4}^{\text{NPM}} + \beta_{2t} D_{i,t-4}^{\text{CFO}} + \beta_{3t} NI_{i,t-4} + \beta_{4t} D_{i,t-4}^{\text{NPM}} NI_{i,t-4} + \beta_{5t} D_{i,t-4}^{\text{CFO}} NI_{i,t-4} \\ & + \beta_{6t} \text{CV(NI)}_{it} + \beta_{7t} \text{CV(CFO)}_{it} + \beta_{8t} \text{BM}_{it} + \beta_{9t} \text{MV}_{it} + \varepsilon_{it} \end{aligned} \tag{6}$$

For brevity, Table 9 only presents the coefficients of interest, which are β_3 (the earnings persistence coefficient), β_4 (incremental persistence due to higher intensity of core net income), and β_5 (incremental persistence due to higher intensity of CFO). Results in panel A suggest that for both the intensity of current CFO and the intensity of core CFO there is no significant difference between the average coefficient on $D_{it-4}^{\text{NPM}} \times \text{NI}_{t-4}$ and the average coefficient on $D_{it-4}^{\text{CFO}} \times \text{NI}_{t-4}$, and they are both positive and significant at the 0.01 level. That is, neither of the intensity measures dominates the other. Rather, both provide incremental information about earnings persistence over one another.

Next, we examine the market reaction to unexpected quarterly earnings, allowing the coefficients on unexpected earnings to vary with D_{it}^{NPM} and D_{it}^{CFO}. We estimate Equation (7) and report the results in Panel B of Table 9:

$$\begin{aligned}\text{AR(LW)}_{it} = {} & \delta_{0t} + \delta_{1t} D_{it}^{\text{NPM}} + \delta_{2t} D_{it}^{\text{CFO}} + \delta_{3t} \text{FE}_{it} + \delta_{4t} D_{it}^{\text{NPM}} \times \text{FE}_{it} \\ & + \delta_{5t} D_{it}^{\text{CFO}} \times \text{FE}_{it} + \eta_{it} \end{aligned} \tag{7}$$

where AR(LW) is excess buy-and-hold return from one day before the preliminary earnings announcement until one day after the SEC filing. We use this

Table 9. The interaction between the ICE and the intensity of CFO

Panel A: The marginal effect of the intensity of net income and the intensity of CFO on earnings' persistence

Dependent variable = current net income		NI_{t-4}	$D_{t-4}^{NPM} \times NI_{t-4}$	$D_{t-4}^{CFO} \times NI_{t-4}$	Adj-R^2N
Current CFO intensity					
1	FINT	0.23 (8.72)***	0.17 (8.91)***	0.16 (8.03)***	0.79 (66,320)
2	IINT	0.20 (8.30)***	0.18 (10.37)***	0.19 (9.49)***	0.79 (66,320)
Core CFO intensity					
3	FINT	0.22 (8.99)***	0.17 (9.25)***	0.16 (8.84)***	0.79 (66,320)
4	IINT	0.21 (8.07)***	0.16 (8.41)***	0.18 (7.51)***	0.79 (66,320)

Panel B: The marginal effect of the intensity of net income and the intensity of CFO on the market reaction to quarterly earnings

Dependent variable = AR(LW)		FE_t	$D_t^{NPM} \times FE_t$	$D_t^{CFO} \times FE_t$	Adj-R^2N
Current CFO intensity					
1	FINT	4.26 (15.07)***	1.86 (5.43)***	1.79 (5.07)***	0.05 (47,827)
2	IINT	3.85 (14.24)***	3.38 (8.70)***	1.56 (4.47)***	0.05 (47,827)
Core CFO intensity					
3	FINT	4.20 (14.63)***	1.65 (4.88)***	2.40 (6.80)***	0.05 (47,827)
4	IINT	3.93 (14.43)***	2.87 (7.01)***	2.28 (5.09)***	0.05 (47,827)

(*Continued*)

Table 9. Continued

Panel C: The marginal effect of the intensity of net income and the intensity of CFO on the post earnings announcement drift

Dependent variable = AR(POSTFILE)		FE_t	$D_t^{NPM} \times FE_t$	$D_t^{CFO} \times FE_t$	Adj-R^2N
Current CFO intensity					
1	FINT	0.67 (4.54)***	0.05 (0.22)	0.00 (0.02)	0.004 (47,827)
2	IINT	0.52 (3.23)***	0.53 (1.96)**	−0.02 (−0.09)	0.004 (47,827)
Core CFO intensity					
3	FINT	0.56 (3.87)***	−0.03 (−0.14)	0.37 (1.51)	0.004 (47,827)
4	IINT	0.52 (1.73)*	0.51 (1.73)*	0.20 (0.65)	0.004 (47,827)

Notes: The table presents results for the interaction between the intensity measure based on net profit margin (NPM) and the intensity measure based on *current* cash flows (CFOINT) and core cash flows (Core CFOINT) for the period 1995–2009. D_{it}^{NPM} is an indicator variable that equals '1' if core earnings intensity (FINT or IINT) for firm i is above the quarterly median at time t, and '0' otherwise; and D_{it}^{CFO} is an indicator variable that equals '1' if the intensity based on cash flows (FINT or IINT) for firm i is above the quarterly median at time t, and '0' otherwise. See Table 2 for definitions of other variables.

Panel A presents average coefficients and corresponding t-statistics from estimating Equation (6). For brevity, we present average coefficients only for β_3, β_4 and β_5. Panel B presents average coefficients and corresponding t-statistics from estimating Equation (7). For brevity, we present average coefficients only for δ_3, δ_4 and δ_5. AR(LW) is excess buy-and-hold return from one day before the preliminary earnings announcement until one day after the SEC filing. Panel C presents average coefficients and corresponding t-statistics from estimating Equation (8). For brevity, we present average coefficients only for λ_3, λ_4 and λ_5.

The intensity of cash flows is calculated as follows: CFO = cash flows from continuing operations; ACC = the accrual component of earnings, measured as the difference between net income and operating cash flows from continuing operations. The intensity of *current* CFO (CFOINT) is computed in a way similar to Sloan (1996): ACC component$_{it}$ = ACC$_{it}$/Av. total assets$_{it}$; CFO component$_{it}$ = CFO$_{it}$/Av. Total assets$_{it}$;

$$\text{CFOINT}_{it} = \frac{|\text{CFO component}_{it}|}{|\text{CFO component}_{it}| + |\text{ACC component}_{it}|}.$$

The intensity of *core* cash flows (Core CFOINT) is calculated as follows:

$\text{CS}_{ik} = \text{CFO}_{it}/\text{Sales}_{it}$; firm-specific core CFO [FCORE(CFO)$_{it}$] = [(CS$_{i,t-4}$ + CS$_{i,t-8}$ + CS$_{i,t-12}$ + CS$_{i,t-16}$)/4]* Sales$_{it}$.

Industry-based core CFO [ICORE(CFO)$_{it}$] = $\left[\sum_{k\in I(i)} \text{CFO}_{kt}/\sum_{k\in I(i)} \text{Sales}_{kt}\right]$*Sales$_{it}$; Core ACC$_{it}$ = Earn$_{it}$ – core CFO$_{it}$;

$$\text{Core CFOINT}_{it} = \frac{|\text{Core CFO}_{it}|}{|\text{Core CFO}_{it}| + |\text{Core ACC}_{it}|}.$$

***Significance from zero at the 0.01 level.
**Significance from zero at the 0.05 level.
*Significance from zero at the 0.10 level.

long return window to ensure that cash flows and accruals are available to equity investors.

Focusing on δ_4 with δ_5, we find that these coefficients are positive and significantly larger than zero at the 0.01 level in all four specifications presented. This result suggests that both the intensity of core net income and the intensity of CFO have incremental information in explaining excess stock returns around the release of unexpected quarterly earnings, and in all cases, except specification 2, neither of the intensity measures dominates the other. In specification 2, δ_4 is 3.38, δ_5 is 1.56, and $\delta_4 - \delta_5$ equals 1.82 (significantly larger than zero at the 0.01 level). That is, the industry-based intensity of core net income dominates the current CFO intensity. Results in Panel B suggest that both intensity measures are useful in explaining contemporaneous stock returns, and are both incremental to one another.

Next, we examine the marginal effect of the intensity of core net income and the intensity of operating cash flows in explaining post-filing excess stock returns. We estimate Equation (8) and present the results in four specifications in Panel C of Table 8:

$$\begin{aligned}\text{AR(POSTFILE)}_{it} = {} & \lambda_{0t} + \lambda_{1t} D_{it}^{\text{NPM}} + \lambda_{2t} D_{it}^{\text{CFO}} + \lambda_{3t} \text{FE}_{it} + \lambda_{4t} D_{it}^{\text{NPM}} \times \text{FE}_{it} \\ & + \lambda_{5t} D_{it}^{\text{CFO}} \times \text{FE}_{it} + \mu_{it} \end{aligned} \tag{8}$$

We find that in all four specifications, the coefficients λ_5 (on the interaction with the CFO intensity) are not significantly different from zero at the 0.10 level. However, the coefficients λ_4 are significantly different from zero at the 0.10 level or better in specifications 2 and 4 (industry-based intensity of core net income). That is, our intensity measure provides incremental explanatory power for post-filing excess returns, while a cash-based intensity measure does not.

Overall, the results in Table 9 suggest that the intensity of core net income and the core CFO intensity provide distinct information over one another in explaining future earnings and contemporaneous excess stock returns. Furthermore, the intensity of core net income, which is based on deviations from normal profit margins, dominates an intensity measure based on CFO in explaining post-SEC filing excess stock returns.

5. Summary and Conclusions

As financial ratios are made up of two economically related measures, a deviation of a ratio from its normal value is more likely to reflect a transitory shock. Thus, for instance, if net income increases, one would expect sales to increase as well, and vice versa. An increase of income (sales) without a corresponding increase in sales (income) is likely to cast doubt on the sustainability of these increases. Using this argument, we construct a simple, yet powerful, measure of earnings

quality that serves investors to imperfectly clear reported earnings of transitory components, and is thus useful in extracting sustainable earnings from reported earnings. This method, which is based on extracting information from profit margins, facilitates the estimation of the core (sustainable) and non-core (transitory) components of earnings, as well as the construction of a new measure associated with the main attributes of earnings quality – the ICE.

Our proposed measure is simple and applicable to public and private firms, at any point in time and for any level of information aggregation. We find that our measure is positively related to earnings persistence, the quality of analysts' earnings forecasts, and the earnings response coefficient, and thus is a valid indicator of the quality of earnings. We compare our measure to an intensity measure based on cash from operations and find that generally the two measures provide incremental information over one another in explaining future earnings and contemporaneous excess stock returns; however, in certain cases, our measure is more useful than a cash-based intensity measure in explaining post-SEC filing excess returns.

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Notes

[1]Dechow et al. (2010) define earnings quality as follows: 'Higher quality earnings provide more information about the features of a firm's financial performance that are relevant to a specific decision made by a specific decision-maker'.

[2]See, for example, Lipe (1986), Wilson (1987), Barth et al. (1992), Ohlson and Penman (1992), Sloan (1996), Ramakrishnan and Thomas (1998), Fairfield and Yohn (2001), Ertimur et al. (2003), Jegadeesh and Livnat (2006), and Kama (2009). Another measure of earnings quality from the perspective of earnings management is the magnitude of discretionary accruals (for example, Jones, 1991; Dechow et al., 1995; Kothari et al., 2005).

[3]Fairfield et al. (2009) argue that while industry analysis yields only marginal incremental information over firm-specific figures in forecasting return on net operating assets (RNOA), return on common equity (ROCE), and growth in net operating assets (NOA), it is useful in predicting future sales growth.

[4]We repeated the analyses using the industry classification suggested by Kenneth French. Results (not tabulated) are very similar. See http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html.

[5]Consistent with Gu and Wu (2003) and Weiss (2010) we require in this analysis that the stock price be at least \$3 to avoid the small deflator problem. We replicate our analysis using all firms with a stock price over \$1, obtaining virtually the same results (not tabulated).

[6]The results (not tabulated) are not sensitive to adding accruals as an additional control variable or omitted the coefficient of variation from the model.

[7]Here, we do not examine the effect of core intensity based on gross profit [INT(GP)], because, as mentioned in Sections 3 and 4.1, the INT(GP) is quite stable (and relatively high) over time and within industry.

[8]We also examined the industry composition of each ICE quintile using the industry classification suggested by Kenneth French. We find that the proportion of computer, software, and electronic equipment (high R&D) firms decreases as we proceed up the intensity quintiles. In contrast, the proportion of consumer nondurable, wholesale, retail, and service (low R&D) firms increases monotonically as we proceed up the intensity quintiles. These findings are consistent with Amir et al. (2003), as earnings forecasts are less accurate (more dispersed) in high R&D industries.

[9]We repeated the analysis in Table 5 using actual earnings as a deflator instead of the beginning-of-quarter stock price obtaining similar results (not tabulated). Also, in measuring analysts' dispersion we limit our sample to firm/quarter observations with a minimum of three different forecasts. Limiting the dispersion analysis to firm/quarter observations with a minimum of two different analysts' earnings forecasts does not change the results qualitatively nor does limiting the analysis of analysts' accuracy and analysts' bias to a minimum of two or three analysts' earnings forecasts. In addition, we repeated the analysis of analysts' accuracy, dispersion, and bias using a sub-sample of firms that report positive earnings. Results (not tabulated, for brevity) are qualitatively the same.

[10]We replicate the analysis of contemporaneous market reaction using standardized unexpected earnings (SUE), and standardized unexpected revenues (SURG) instead of analysts' forecasts error. Results (not tabulated) regarding the effect of the ICE on market reaction to unexpected earnings are qualitatively the same. We also repeated the industry-based analysis using IINT(NI) in quarter $t - 4$ obtaining similar results.

[11]When the intensity of core net income is based on firm-specific profit margins (specifications 3 and 5), the coefficients κ_1 are positive at the 0.05 level for the PREFILE window (specification 3) and at the 0.10 level for the POSTFILE window (specification 5). This evidence suggests that firms with above-median firm-specific intensity of core net income have stronger drifts, regardless of the magnitude of unexpected earnings.

[12]The Spearman correlations between cash-based intensity measures and income-based intensity measures range from 0.12 to 0.37. The Spearman correlations between D_{it}^{NPM} and D_{it}^{CFO} range from 0.09 to 0.29.

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