International Diversification, SFAS 131, and Post-Earnings Announcement Drift

Tony Kang
McMaster University
kangt@mcmaster.ca

Inder Khurana
University of Missouri
khuranai@missori.edu

John Wang
Florida International University
cwang@fiu.edu

October 2015

Abstract

Using data from 1990-2013, we show 1) the serial correlation of analyst forecast errors increases in the extent of international diversification, 2) PEAD based on analyst forecast errors increases in the extent of international diversification, and 3) the impact of international diversification on the serial correlation of analyst forecast errors and the associated drift is significantly reduced after the implementation of SFAS 131. When we replicate our tests using seasonally differenced earnings, we fail to observe patterns similar to those using analyst forecast errors. Overall, our findings point to the usefulness of accounting information to assist capital markets in pricing earnings of internationally diversified firms.

International Diversification, SFAS 131, and Post-Earnings Announcement Drift

1. Introduction

More than four decades of research on post-earnings announcement drift (PEAD) consistently documents that a stock's cumulative abnormal returns drift in the direction of an earnings surprise for several weeks following an earnings announcement.[1] While a majority of prior research focuses on the drift associated with seasonal random walk-based earnings surprises, recent studies document a drift associated with analyst-based earnings surprises that not only differs from but also yields larger returns than drift associated with seasonal random walk-based earnings surprises (Doyle et al. 2006; Livnat and Mendenhall 2006). Livnat and Mendenhall (2006) suggest that the difference in the two drifts is attributable to the inefficiency of earnings expectations. A related but separate stream of research argues that international diversification increases complexity and uncertainty in a firm's operating and information environments (e.g., Goldberg and Heflin 1995; Reeb et al. 1998; Duru and Reeb 2002). This complexity and uncertainty in turn makes information processing difficult (Egelhoff 1991; Kim and Maborgne 1995), which affects analyst forecast accuracy and bias (Duru and Reeb 2002).

In this paper, we investigate the impact of international diversification on the efficiency of analyst forecasts, as manifested in the autocorrelation in analyst earnings forecast errors. We also examine whether the predictable cross-sectional variation in the autocorrelation pattern can be exploited to earn abnormal returns. Finally, we assess whether improved geographic segment reporting under Statement of Financial Accounting Standards No. 131 (SFAS 131), *Disclosures*

[1] See Kothari (2001) for a brief review.

about Segments of an Enterprise and Related Information, mitigates the impact of international diversification on the above relations.[2]

We predict that international diversification is likely to exacerbate the analysts' underestimation of the implications of current earnings for future earnings, as measured by the serial-correlation of analyst forecast-based earnings surprises. There are at least two reasons for this prediction. First, prior research suggests that the complexity and uncertainty of internationally diversified firms increase the difficulties in predicting earnings by even the financial analysts (Egelhoff 1991; Kim and Maborgne 1995; Haskins et al. 2000; Duru and Reeb 2002). Second, prior research (Markov and Tamayo 2006) proposes a rational learning-based explanation for the serial correlation pattern in analysts' quarterly earnings forecast errors. Under this framework, analysts are uncertain about the underlying parameters of the earnings generating process and initially underestimate these parameters. While analysts learn rationally about the underlying parameters over time, the serial correlation in the analysts' forecast errors may still persist as the true auto-regressive parameter can change for a variety of reasons such as changes in the economy, accounting regulation, and/or reporting incentives. The parameter uncertainty is especially severe for firms with more international diversification because international diversification increases the complexity and uncertainty in a firm's operating and

---

[2] SFAS 131, which superseded SFAS 14 *Financial Reporting for Segments of a Business Enterprise*, became effective for fiscal years beginning after December 15, 1997. Firms were required to disclose segment information by both line of business and geographic area with no specific link to the internal organization of the company under SFAS 14. SFAS 131 permits firms to disclose country-level geographic information for "material" countries and to aggregate immaterial countries into a single "other foreign" segment. Further, SFAS 131 no longer requires firms to disclose earnings for secondary segments for firms that define their primary operating segments on the basis other than geographical area (Herrmann and Thomas 2000). Materiality is not specifically defined for enterprise-wide disclosures. According to Herrmann and Thomas (2000), many companies use 10% as a threshold. Doupnik and Seese (2001), however, find that many firms use quantitative thresholds less than 10%. In addition to providing information by individual material country, SFAS 131 indicates that "an enterprise may want to provide subtotals of geographic information about groupings of countries" (paragraph 38).

information environments. Thus, the level of international diversification is expected to be associated with more serial correlation of analyst forecast errors.

Next, we predict that the drift based on analyst forecast errors, which reflects delayed price adjustments to the implication of current earnings for future earnings, is likely to increase with international diversification, holding other things constant. Prior studies (Hope et al. 2008; Thomas 1999) show that investors misprice earnings from foreign operations. Khurana et al. (2003) find that analyst forecast inefficiency largely explains the market's mispricing of foreign earnings. The implication is that analysts' under-reaction to earnings information are likely to translate into the market's mispricing. Moreover, the impact of international diversification on the serial correlation of analyst forecast errors will manifest in stock prices as investors trade in response to analyst forecasts (Battalio and Mendenhall 2005; Ayers et al. 2011). As such, we expect that the PEAD based on analyst forecast errors to be larger when the firm is more internationally diversified.

While these predictions are plausible, they may not hold over time because of the implementation of SFAS 131. Segment information is essential for investors to understand the nature and diversification strategy of companies and to assess the sources of consolidated earnings. For multi-segment companies, analysts first forecast segment-level earnings and then aggregate them at the entity level (You 2014). SFAS 131 not only increased both the quantity and quality of segment information but also the informativeness of segment information. For example, Street et al. (2000) and Herrmann and Thomas (2000) report an overall increase in the lines of business reported subsequent to SFAS 131. Berger and Hann (2003), who also document that SFAS 131 increased the number of reported segments and provided more disaggregated information, find that analysts' earnings forecast errors significantly reduced in the post–SFAS

131 period for firms that changed their number of reported segments. Moreover, prior research (e.g., Nichols et al. 2000; Herrmann and Thomas 2000; Hope et al. 2009) find more firms provide country-level geographic segment disclosures after the implementation of SFAS 131. Thus, the impact of international diversification on the serial correlation of analyst-based forecast errors and consequently, the association between PEAD based on analysts forecast errors and international diversification should be less pronounced after the implementation of SFAS 131 because improved reporting reduces uncertainty and makes stocks easier to value (Kumar 2009).

Using data from 1990-2013, we find that international diversification increases the positive correlation between current and prior quarters' analyst forecast-based earnings surprises. In other words, firms that are more internationally diversified exhibit larger autocorrelations of analyst forecast errors. This evidence is consistent with Duru and Reeb (2002), who document analysts' inefficiency in predicting future performance of internationally diversified firms. Moreover, we find the positive autocorrelations of analyst forecast errors decreased after the implementation of SFAS 131, which is consistent with Berger and Hann (2003) who show improved analyst forecast accuracy after the implementation of SFAS 131. We also find that the PEAD using analyst forecast-based earnings surprises significantly increases with international diversification and that this positive association is less pronounced subsequent to the implementation of SFAS 131. These results hold after controlling for factors that have been shown in prior research to affect autocorrelations of analyst forecast errors and PEAD. Moreover, these results are robust to alternative measures of international diversification that capture the extent as well as diversity in international operations.

When we replicate the same cross-sectional and time-series tests using seasonal random walk-based earnings surprises, we find that international diversification does not affect the positive autocorrelations of seasonal random walk-based earnings surprises. Further, these positive autocorrelations are not affected by the implementation of SFAS 131. We also find that PEAD based on seasonal random walk-based earnings surprises does not exhibit an association with the extent of international diversification. These additional results support our findings using analyst forecast-based earnings surprises are not due to spurious correlations.

To highlight the contribution of our paper, it is useful to juxtapose our results against prior research on PEAD. Prior research (e.g., Bernard and Thomas 1989, 1990; Bhushan 1994; Ng, et al. 2007; among others) has identified at least three potential explanations for PEAD: transaction costs, omitted risk factors, and mispricing due to investors' delayed reaction to announced earnings. In our context, if PEAD is mainly due to transaction costs and/or omitted risk factors, then international diversification should have a similar impact on PEAD, irrespective of how earnings surprise is computed. However, our results indicate that international diversification has an impact on the serial correlation of analyst-based earnings surprise and on drift based on analyst-based forecast errors; seasonally adjusted earnings surprises do not exhibit such patterns. Further, our inter-temporal tests to exploit an exogenous factor, in particular, the implementation of SFAS 131 on the above associations, find that SFAS 131 reduces the impact of international diversification on analysts' under-reaction, leading to less PEAD based on analyst forecast errors. Again, our results show that the implementation of SFAS 131 does not reduce the association between the serial correlation of seasonally differenced earnings and international diversification. Thus, our cross-sectional and inter-temporal tests also highlight delayed reaction to announced earnings as a more likely explanation for PEAD. Given that we link cross-sectional and inter-temporal variation in abnormal returns to predictable variation in the serial correlations of earnings surprises, we view our study as a complement to studies on PEAD such as Narayanamoorthy (2006), who exploits cross-sectional difference in conservatism and Rangan and Sloan (1998) who focus on cross-quarter variation in autocorrelations.

Our results also provide direct evidence in support of Livnat and Mendenhall's (2006) suggestion that the difference in the two drifts, analyst forecast-based and seasonal random walk-based, is attributable to the inefficiency of earnings expectations. As such, our results complement the findings of Battalio and Mendenhall (2005) and Ayers et al. (2011) that earnings expectations of different investors and resultant trading behavior give rise to two distinct post-earnings announcement drifts. Our results also complement Kimbrough (2005) who shows that the initiation of conference calls reduce analysts' under-reaction to announced earnings news. Unlike Kimbrough (2005), who explores a voluntary disclosure setting, we examine the beneficial role of the improved mandatory disclosures in reducing mispricing for internationally diversified firms. Our result has important implications for accounting regulators as it suggests that these disclosures are useful signals that assist capital markets in pricing earnings of internationally diversified firms.

Our results also contribute to the literature on international diversification. Prior studies find that greater international diversification adversely impacts analyst forecast accuracy and increases forecast bias (Duru and Reeb 2002). Our results indicate that international diversification also increases the serial correlation of analyst forecast errors. Given that forecast error in a given quarter does not imply serial correlation of those errors over multiple quarters, these results shed light on multi-period (as opposed to single period) properties of analysts' earnings forecasts. Specifically, our results indicate that international diversification exacerbates analysts' underestimation of the implication of current earnings for future earnings.

The remainder of the paper is organized as follows. In the next section, we review related literature and develop our hypotheses. In Section 3, we explain the research design and sample selection. Section 4 presents the empirical results and section 5 concludes the paper.

2. Prior Literature and Hypotheses Development

2.1 Relevant literature on PEAD

Post-earnings announcement drift refers to a phenomenon that a stock's abnormal returns drift in the direction of an earnings surprise after an earnings announcement (e.g., Ball and Brown 1968; Bernard and Thomas 1989). Traditionally, the earnings surprise is measured as the seasonally adjusted quarterly earnings. This line of research shows that seasonally adjusted quarterly earnings are serially correlated, suggesting that current earnings have implications for future earnings. However, investors seem to ignore or underestimate the serial correlation in seasonally adjusted quarterly earnings. This inability to assess the implication of current earnings for future earnings results in prices that do not reflect all of the information contained in current earnings surprises, which leads to under-reaction and anomalous future returns (e.g. Rendleman et al. 1987; Freeman and Tse 1989; Bernard and Thomas 1990; Ball and Bartov 1996).

A number of studies have attempted to explain why PEAD occurs and why it has persisted. Explanations offered for the PEAD phenomenon include: (a) the inadequacy of the capital asset pricing model as a model of asset pricing (Foster et al. 1984; Ball et al. 1993); (b) the market's failure to fully reflect the attributes of the stochastic process of underlying earnings (Rendleman et al. 1987; Freeman and Tse 1989; Bernard and Thomas 1989, 1990; Bartov 1992; Ball and Bartov 1996; Rangan and Sloan 1998; Soffer and Lys 1999; Narayanamoorthy 2006);

(c) the transaction costs and market frictions (Bhushan 1994; Mendenhall 2004; Ng et al. 2007; Chordia et al. 2009; Chung and Hrazdil 2011); and (d) information uncertainty (Jiang et al. 2005; Francis et al. 2007). Disentangling these explanations continues to permeate a significant fraction of the academic literature devoted to PEAD. Even within the investors' irrationality explanation, there are unsettled issues about whether and to what extent investors are irrational in forming their earnings expectations (Ball and Bartov 1996; Soffer and Lys 1999; Mendenhall 2002; Chen 2013),[3] whether investors have different earnings expectations and what kind of investors are more subject to irrationality (Walther 1997; Bartov et al. 2000), and what the market's aggregated earnings expectations are (Calegari and Fargher 1997; Hughes et al. 2008).

Notable in the context of our paper is the role of analysts in either mitigating or contributing to the drift. Arguing that a simple seasonally adjusted difference in earnings may be an insufficient statistic to identify earnings surprise, Mendenhall (1991) and Abarbanell and Bernard (1992) use earnings surprises based on analyst forecasts. They document that analyst forecast errors are also serially correlated, suggesting that financial analysts do not fully incorporate the implications of current earnings for future earnings in their earnings forecasts. Furthermore, using earnings surprises based on analyst forecasts, Doyle et al. (2006) find a positive relation between current analyst forecast errors and subsequent long-term abnormal returns measured over one, two, and three-year periods.

[3] Ball and Bartov (1996) find that about 50% of serial correlation of seasonally differenced earnings is incorporated in investors' earnings expectations (measured at two days before the earnings announcement) and conclude that investors are aware but underestimate the autocorrelation patterns in quarterly earnings. Similarly, Mendenhall (2002) finds that PEAD is not associated with firm-specific earnings persistence, suggesting that investors recognize the serial correlation of seasonally differenced earnings. However, Soffer and Lys (1999) find that upon earnings announcements, investors are unaware of this serial correlation, but information disseminated after earnings announcement revises investors' earnings expectations to a level that reflects the serial correlation of earnings surprises. Chen (2013) finds that the magnitude of PEAD is positively related to time-varying earnings persistence, suggesting that investors do not fully recognize the differences in the time-varying serial correlation of earnings surprises across firms.

Taking a step further, Livnat and Mendenhall (2006) assess the differences in the magnitude and pattern of the serial correlations of seasonal random walk-based earnings surprises and analyst earnings forecast errors. Further, they assess the differences in the magnitude and pattern of post-earnings announcement abnormal returns generated by portfolios formed on the basis of these two earnings surprises. They find that PEAD is significantly larger when defining the earnings surprise using analysts' forecasts than when using a seasonal random walk model of earnings as expected earnings. Moreover, Livnat and Mendenhall (2006) suggest that the difference in the two drifts is attributable to the inefficiencies of corresponding earnings expectations. Consistent with this conjecture, Battalio and Mendenhall (2005) and Ayers et al. (2011) find that earnings expectations of different investors and resultant trading behavior give rise to two distinct post-earnings announcement drifts. In particular, Battalio and Mendenhall (2005) find that investors initiating large trades respond to analysts' forecast errors. Similarly, Ayers et al. (2011) find that institutional investors' trading pattern is more consistent with their use of analyst forecasts in forming earnings expectations as they continue to trade in the direction of analyst forecast errors after the earnings announcement.

In this study, we argue that the extent of international diversification, a firm characteristic, affects not only the efficiency of analyst earnings expectation in the form of the serial correlation of analyst forecast error but also the associated drift.

2.2 Relevant literature on International Diversification

Firms diversify internationally for reasons such as growth through expansions to new markets (Penrose 1959), access to both natural and human resources (Stultz 1981), reduction of idiosyncratic risk (Amihud and Lev 1981), managers' prestige associated with running a global firm, higher pay (Jensen 1986), and opportunities for entrenchment as they become more valuable to a more complex firm (Reeb et al. 2001). From an informational perspective, international diversification can increase complexity and uncertainty in a firm's operating and information environments due to the more volatile operating environments overseas and stakeholders' unfamiliarity with the international operating environment (e.g., Goldberg and Heflin 1995; Reeb et al. 1998; Duru and Reeb 2002). This complexity and uncertainty can increase the difficulties of information processing (Egelhoff 1991; Kim and Maborgne 1995). Thomas (1999) suggests that foreign earnings may be difficult to analyze because either there is less public information or the information is more complex to analyze.[4] In a similar vein, Burgman (1996) suggests that cultural differences, language and legal system differences can create information deficiency for internationally diversified firms. To the extent that the precision of analysts' private information about a firm's future performance declines with the degree of international diversification, while the complexity of the forecasting task increases with the degree of international diversification, international diversification can affect the efficiency of analyst's earnings expectations.

2.3 Hypothesis Development

Duru and Reeb (2002) document that analyst earnings forecasts are not only less accurate but also more optimistically biased for more internationally diversified firms. They offer an incentive-based explanation for the optimistic bias in the analysts' earnings forecasts of internationally diversified firms. Under this explanation, analysts issue more optimistically biased forecasts to curry favor with the management in order to gain access to inside information (Francis and Philbrick 1993; Das et al. 1998; Lim 2001; Barber et al. 2006). This explanation is

[4] Consistent with the notion that sophisticated investors are better equipped to analyze the often scant publicly available information, Callen et al. (2005) find that institutional investors are less biased than other investors in assessing the importance of domestic versus foreign earnings.

reasonable in our setting where analysts may not be familiar with the operating environments of internationally diversified firms. Kunda (1990) argues that individuals' motives can affect their cognitive processing and lead them to either accurate or biased conclusions. Bradshaw et al. (2015) argue and find empirical evidence that greater forecast difficulty allows more justifications for analysts to support a biased forecast. To the extent that the optimistic forecast bias persists, analyst forecast-based earnings surprises are expected to be more serially correlated for firms with greater international diversification.

Another reason for why international diversification can increase the serial correlation of analyst forecast based earnings surprises can be understood using the rational learning-based explanation of Markov and Tamayo (2006). In particular, they argue that analysts are aware that quarterly earnings follow an auto-regressive process in seasonal differences with a drift and that they follow this process to form expectations of quarterly earnings. However, analysts are uncertain about the underlying parameters of the earnings generating process and initially underestimate but learn rationally about these parameters over time. Using simulation and actual analyst forecasts, they find confirmatory evidence. .

They also argue that the serial correlation in the analysts' forecast errors may persist as the true auto-regressive parameter can change for a variety of reasons such as changes in the economy, accounting regulation, and/or reporting incentives. For example, Rangan and Sloan (1998) find that the auto-regressive structure of seasonally differenced quarterly earnings changes with more auto-regression for conjunct quarters within the same fiscal year after the introduction of an integral approach to interim reporting. Furthermore, analysts might not learn all the factors that can impact the true auto-regressive parameter. For instance, Basu et al. (2010) document that analysts do not fully incorporate the effects of inflation in their earnings forecasts, and they argue that analysts frame the earnings forecasting problem too narrowly and ignore information that does not relate directly to the firm. In our setting, we argue that internationally diversified firms are more subject to factors that can affect the auto-regressive parameters.[5] To the extent that this effect is not fully anticipated by the analysts and that they gradually learn about it, the serial correlation of analyst forecast errors is expected to increase in the extent of international diversification.

The serial correlations of analyst forecast errors, i.e., earnings surprises, will give rise to drift when investors, faced with a subsequent surprise in the same direction, realize that their reaction to the prior earnings surprise was incomplete (Abarbanell and Bernard 1992). As such, the impact of international diversification on the serial correlation of analyst forecast errors will manifest in stock prices as investors trade in response to an analyst forecast (Battalio and Mendenhall 2005; Ayers et al. 2011). Thus, we expect PEAD based on analyst forecasts errors to increase in the extent of international diversification. Our hypotheses can be formally stated as follows:

H1: The serial correlation of analyst earnings forecast errors is positively related to the extent of international diversification.

H2: PEAD based on analysts forecast errors is positively related to the extent of international diversification.

While these predictions are plausible, it may not necessarily be the case because of the mandated disclosures pertaining to geographic segment operations. Tan et al. (2011) suggest that mandatory disclosure requirements can influence analyst behaviors, i.e., analysts' incentives to

---

[5] As an example, consider exchange rate fluctuations as one of the factors that make the forecasting of earnings of internationally diversified firms more difficult. Because exchange rates convert prices or values denominated in one currency into prices or values denominated in another currency, any exchange rate fluctuation should have a significant effect on the performance and valuation of internationally diversified firms. However, Bartov and Bodnar (1994) find that both investors and analysts under-react to the impact of exchange rate on a firm's valuation and performance.

follow a firm and their forecast accuracy. Using the 2005 mandatory adoption of International Financial Reporting Standards (IFRS) worldwide as their setting, Hung et al. (2014) predict that PEAD should decrease subsequent to increased financial-reporting quality if PEAD is driven by investors' incomplete reactions to earnings news.[6] Consistent with this prediction, they find a greater reduction in PEAD among firms with larger changes to their financial reporting and an increase in analyst forecast accuracy.

An advantage of utilizing the international diversification to shed light on whether the inefficient earnings expectations lead to PEAD is that we are able to explore the mandatory reporting changes with respect to geographic segments. Empirical research (e.g., Herrmann and Thomas 2000; Behn et al. 2002; Berger and Hann 2003) find that the transparency of segment disclosure improved after SFAS 131 and such improvement reduced analyst forecasting difficulty. To the extent that the implementation of SFAS 131 provides more information about a firm's foreign operations, it facilitates analysts to forecast future earnings. In other words, analyst forecasts are expected to be more accurate and less biased, and thus reflect more efficient earnings expectations after the implementation of SFAS 131. Hence, SFAS 131 can have a systematic impact on the serial correlation of analyst forecast errors, and can subsequently reduce the impact of international diversification on the PEAD based on analyst forecast errors.

3. Data and Empirical Models

3.1 Data

[6] In their framework, increased financial reporting quality represents two non-mutually exclusive concepts: increased disclosure, defined as the revelation of facts and measurement issues, and improved comparability, defined as the quality of information that enables users to identify similarities in and differences between two sets of economic phenomena.

Our sample period is from 1990 to 2013.[7] We obtain the quarterly financial statement data and quarterly earnings announcement dates from COMPUSTAT quarterly industrial and research files. Firms are required to have valid quarterly earnings announcement dates. Daily stock returns and trading volume data are from the Center for Research in Security Prices (CRSP). We use foreign and domestic sales data from the segment files of COMPUSTAT to identify firms with foreign operations. We require firms to have positive foreign sales and domestic sales. To calculate the earnings surprise based on analyst consensus forecast, we obtain the analyst forecasts and corresponding announced earnings from the Unadjusted Detail History file of I/B/E/S.[8] The institutional ownership data for each firm quarter are from the CDA/Spectrum database of Thomson Financials.

We first perform the tests on the full sample, which includes all observations in the sample period. The full sample, which is used for presenting the descriptive statistics and the correlations among variables, comprises of 98,548 firm-quarter observations for 3,815 firms. Because prior studies document that SFAS 131 had a systematic influence on analyst earnings forecast properties of multi-segment firms (Behn et al. 2002; Berger and Hahn 2003), we also present our empirical results separately for the pre- and post-SFAS 131 periods.[9] Next, we require that firms appear in both the pre- and post- SFAS 131 periods. This requirement allows us to compare the impact of international diversification on the serial correlation and the PEAD before and after the change of geographic segment disclosure, while keeping the firm constant.

---

[7] To mitigate the concern that the sample includes observations during the recent global financial crisis, we deleted all observations from 2008 and onwards and repeated the analyses. The results continue to be robust.

[8] IBES adjusts forecasts and actual data for stock splits and rounds them to the nearest cent in the Summary file. This procedure could lead to the rounding errors (Baber and Kang 2002; Diether et al. 2002; Payne and Thomas 2003). To avoid this problem, we employ unadjusted earnings and forecast data from IBES Unadjusted Detail History file.

[9] The classification is based on the fiscal year end (i.e., 12/31/1998). As such, observations in calendar year 1998 could be classified as either pre-SFAS 131 or post-SFAS 131 because SFAS 131 required all firms with fiscal years starting after December 15, 1998 to apply the standard.

Thus, it alleviates a potential concern that a differential impact between the two periods arises from cross-sectional differences in companies' serial correlation and PEAD. The constant sample comprises of 56,684 firm-quarter observations for 1,295 firms. Panel A of Table 1 shows the sample reconciliation.

[Insert Table 1]

3.2. Measurement of Variables

3.2.1 Earnings surprise

Earnings surprise is the actual earnings minus expected earnings, scaled by stock price. Following Livnat and Mendenhall (2006) and Chung and Hrazdil (2011), we define expected earnings based on the consensus analyst forecasts obtained from the I/B/E/S database and compute earnings surprise (*UE_AF*) as:

$$UE\_AF = (EPS_t - AF_t)/P_t \qquad (1)$$

where EPS_t is the actual quarterly earnings per share for quarter t, AF_t is the consensus analyst forecast of earnings per share for quarter t, and P_t is the stock price at the end of quarter t.[10] AF_t is measured using unadjusted forecast data from the detail files of I/B/E/S. Specifically, we obtain the most recent earnings forecast of each individual analyst who provides earnings forecast during the 90-day period before the earnings announcement and use the median value of these forecasts as the consensus analyst forecast.

Following prior studies (e.g., Livnat and Mendenhall 2006), we standardize the earnings surprise measures by converting *UE_AF* into earnings surprise deciles, *SUE_AF*, then scaling them to range between 0 and 1, and further subtracting 0.5 from the decile rank. The advantage

[10] The results are qualitatively similar when we use the stock price at the beginning of the quarter.

of this transformation is that the coefficient on *SUE_AF* for the drift test represents a hedge portfolio return that is long on the most positive decile and short on the most negative decile.

3.2.2. Abnormal stock returns

While the buy-and-hold abnormal returns (*BHAR*) and the cumulative abnormal returns (*CAR*) are not likely to diverge much over short windows, Barber and Lyon (1997) suggest that the *BHAR* is the conceptually more appropriate measure over relative long windows. Therefore, we measure the drift as the *BHAR*, which is calculated by compounding the raw return for the security over a specified event period and subtracting the compound return of expected returns over the same period. Following prior studies, we use the 60-day period subsequent to quarter t's earnings announcement date as the event period. Therefore, the *BHAR* is measured as follows:[11]

$$BHAR = \prod_{t=1,60} (1+R_{it}) - \prod_{t=1,60}(1+ER_{it}) \qquad (2)$$

where R_{it} is the daily return for firm *i* on day *t*, inclusive of dividends and other distributions. If a firm delists during the return accumulation window, we compute the remaining return by using the CRSP daily delisting return (see Shumway, 1997). ER_{it} is the expected return for firm *i* on day *t*.

We estimate expected returns in three ways. First, we follow earnings-related anomalies research to use portfolio return as expected return. Specifically, we use value-weighted market index as expected return.[12] This market-adjusted abnormal return (*BHAR_MKT_60*) adjusts for the market performance and is not affected by measurement issues associated with using more sophisticated abnormal return measures. To account for cross-sectional differences in risk, we

[11] We do not delete extreme but valid return observations to be consistent with the forecasting exercise that an investor undertakes (e.g., Kothari et al. 2005).

[12] We also use size-decile portfolio return and six size and book-to-market (2 size x 3 book-to-market) portfolio returns.

next follow prior studies (e.g. Ogneva and Subramanyam 2007; Balakrishnan et al. 2010) to estimate expected return based on Fama and French's (1996) three-factor model. Specifically, we first estimate the following model using a 40-trading day hold-out period, starting 55 trading days prior to the earnings announcement date:

$$R_{it} - RF_t = \mathrm{a} + bi{*}MktRF_t + si{*}SMB_t + hi{*}HML_t \qquad (3)$$

where R_{it} is the daily return for firm i on day t, inclusive of dividends and other distributions, with the adjustment of the delisting returns. RF_t is the one-month T-bill daily return, $MktRF_t$ is the daily excess return on a value-weighted aggregate equity market proxy, SMB_t is the return on a zero-investment factor mimicking portfolio for size, HML_t is the return on a zero-investment factor mimicking portfolio for book-to-market value of equity.[13] The estimated slope coefficients *bi, si,* and *hi* from the hold-out period are then used to compute the expected return for firm i on day t as follows: $ER_{it} = RF_t + bi{*}MktRF_t + si{*}SMB_t + hi{*}HML_t$. We refer the *BHAR* based on Fama and French's (1996) three-factor model as *BHAR_FF3_60*.

Finally, we follow Barber and Lyon (1997) and Doyle et al. (2006) to use a two-characteristic (book-to-market and size) control firm approach to measure expected return. Specifically, for each firm year observation, we first match it with all firms (in the sample) with market value of equity between 70% and 130% of the market value of equity of the sample firm; from this set of firms we choose the firm with the closest book-to-market ratio to that of the sample firm. The return of the control firm serves as the expected return for the treatment firm. This approach mitigates any potential bias due to the composition of the sample as this bias is

[13] *RF, MktRF, SMB*, and *HML* are obtained from Professor Kenneth French's website (http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/ data_library.html).

present in both the treatment and control firm returns (Barber and Lyon 1997; Doyle et al. 2006). We refer the *BHAR* based on Barber and Lyon (1997) as *BHAR_BL_60*.

3.2.3. Test Variables

Measures of international diversification

Prior research has measured the extent of international diversification using foreign sales ratio, foreign assets ratio, geographic segments, a sales-based or asset-based Herfindahl-Hirschman index, or a principal factor of these measures (Denis et al. 1997, 2002; Duru and Reeb 2002; Thomas 2002). Using pre-SFAS 131 data, Duru and Reeb (2002) obtain similar inferences when they measure international diversification as a principal factor of foreign sales ratio, foreign assets ratio, and the number of geographic segments or just the foreign sales ratio. Since the nature of geographic segment reporting changed after SFAS 131, it is difficult to use the number of segments to gauge the degree of diversification for our sample. It is also not feasible to use foreign assets since this data are largely unavailable for firm-year observations on Compustat segment files subsequent to SFAS 131. Though foreign sales to total sales ratio (*FSTS*) has been widely used as proxy of international diversification, it does not capture diversity in international diversification: the same foreign sales to total sales ratio could come from one foreign country or from many foreign countries. In light of these concerns, we use a sales-based Herfindahl-Hirschman index (*HHI*) based on geographic segments as the primary measure of international diversification.[14] Specifically, *HHI* (firm and year subscripts are omitted) is measured as:

$$HHI = 1 - \Sigma^{n}_{j=1} (Sale_j/\Sigma Sale_j)^2 \qquad (4)$$

[14] The segment data from Compustat is annual data. As such, this measure does not change from quarter to quarter within a year.

where $SALE_j$ is the sales revenue for each geographic segment j. The value of *HHI* ranges from 0 to 1 with higher value indicating more international diversification. We transform *HHI* to the decile rank ranging between 0 and 1, and label it as *DHHI.*

3.3 Empirical models

3.3.1 Cross-sectional and inter-temporal test of the association between international diversification and the serial correlation of earnings surprises

To test our hypothesis H1, we estimate the following regression model (firm subscript is omitted):

$$SUE\_AF_t=\beta_0 + \beta_1 SUE\_AF_{t-1} + \beta_2 DHHI_t + \beta_3 SUE\_AF_{t-1}*DHHI_t + \beta_7 DMV_t + \beta_8 SUE\_AF_{t-1}*DMV_t + \varepsilon_t \quad (5)$$

where all variables are as defined before**.**

Prior studies find that analysts have the information processing difficulty in forecasting firms' earnings. Specifically, Mendenhall (1991) and Abarbanell and Bernard (1992) find that consecutive quarters' earnings forecast errors are positively correlated, suggesting that analysts under-react to the information contained in prior quarter's earnings in forming current quarter's earnings expectation. Therefore, the coefficient of β_1 is expected to be positive.

Hypothesis H1 predicts that international diversification is associated with more under-reaction to prior earnings information. Thus, the coefficient β_3 on $SUE_{t-1}*DHHI_t$ in model (5) is expected to be positive.[15] To the extent that improved geographic segment disclosure upon the implementation of SFAS 131 mitigates the adverse impact of international diversification on analyst's under-reaction to prior earnings information, we expect the coefficient β_3 on $SUE_{t-1}*DHHI_t$ to be lower in the post-SFAS131 period relative to the coefficient β_3 in the pre-SFAS 131 period.

[15] In section 4.6.2, we examine the channel through which international diversification affects the serial correlation of analyst earnings forecast errors.

In the tests examining the serial correlation of earnings surprises, we control for firm size, which is shown in prior research to be associated with autocorrelation of seasonal differenced earnings (e.g., Bernard and Thomas 1990). Firm size is measured as the market value of equity (*MV*) as of the beginning of the fiscal quarter.

3.3.2 Cross-sectional and inter-temporal test of the association between international diversification and the post-earnings announcement drift

To test hypotheses H2, which focus on the impact of international diversification on the drift, we estimate the following model:

$$BHAR = \beta_0 + \beta_1 * SUE\_AF_t + \beta_2 * DHHI_t + \beta_3 * SUE\_AF_t * DHHI_t + \beta_4 * DMV_t + \beta_5 * SUE\_AF_t * DMV_t + \beta_6 * DVOL_t + \beta_7 * SUE\_AF_t * DVOL_t + \beta_8 * DPRC_t + \beta_9 * SUE\_AF_t * DPRC_t + \beta_{10} * DIH_t + \beta_{11} * SUE\_AF_t * DIH_t + \beta_{12} * BM_t + \varepsilon_t \quad (6)$$

where *BHAR* is either *BHAR_MKT_60* or *BHAR_FF3_60* or *BHAR_BL_60,* and all other variables are defined as below.

If international diversification exacerbates stock prices' under-reaction to the information contained in analyst earnings forecast errors, we expect the coefficient β_3 on $SUE\_AF_t*DHHI_t$ in model (6) to be positive under Hypothesis H2. Moreover, to the extent that improved geographic segment disclosure upon the implementation of SFAS 131 mitigates the impact of international diversification on this under-reaction, we predict the coefficient β_3 on $SUE\_AF_t*DHHI_t$ to be lower in the post-SFAS131 period relative to the coefficient β_3 in the pre-SFAS 131 period.

In the tests examining the post-earnings announcement drift, we include control variables drawn primarily from Bartov et al. (2000) and categorize them into the following groups: (i) a firm's information environment proxied by firm size (*MV*); (ii) transaction costs proxied by trading volume and stock price (Bhushan 1994); and (iii) investor sophistication proxied by institutional ownership. The trading volume (*VOLUME*) is measured as the average daily dollar trading volume of the firm during the earnings announcement month. Price (*PRICE*) is the average daily closing price of the firm in the announcement month. Following Bartov et al. (2000), the institutional investor holding (*IH*) for each quarter *t* is the percentage of common shares held by institutional investors at the end of the calendar quarter prior to the earnings announcement date. We further transform the *MV, VOLUME, PRICE,* and *IH* of each quarter to the decile rank ranging between zero and one, and label them as *DMV*, *DVOL*, *DPRC*, and *DIH*, respectively. We also follow prior studies (e.g., Ng et al. 2007) to include a firm's book-to-market ratio (*BM*) as a further control for asset pricing risk.

4. Empirical results

4.1. *Descriptive statistics*

Panel B of Table 1 presents descriptive statistics of selected variables by year. The average number of reported geographic segments (*NUM_GEO)* ranges between 2.726 and 2.913 prior to the implementation of SFAS 131. In 1999, the average number of reported geographic segments increases to 3.594 and then gradually increases to 4.426 by 2012. The mean (median) value of *HHI,* the geographic segment sales based Herfindahl-Hirschman index increases from 0.377 (0.396) in 1990 to 0.488 (0.500) in 2013. The mean (median) value of *FSTS* increases from 0.282 (0.260) in 1990 to 0.409 (0.387) in 2013. *ID,* the international diversification index, exhibits the similar trends of *HHI* and *FSTS*. Across all the measures of international diversification, there is an increasing trend over our sample period of international diversification.

Table 2 present descriptive statistics. The mean (median) of the abnormal return measures ranges from -0.004 to 0.009 (-0.007 to 0.000). By construction, the mean of *BHAR_BL_60* is 0 as it is the difference between the buy-and-hold return of treatment firm and that of control firm while the control firm comes from within the original sample. The distributions of these returns, in terms of the standard deviation and the quartile figures, are fairly comparable across the three measures. The mean and median value of earnings surprises based on analyst forecasts (*UE_AF*) are -0.001 and 0.000 respectively, with relatively small standard deviation of 0.047.

[Insert Table 2]

The mean of the number of geographic segments (*NUM_GEO*) is 3.681. The mean (median) value of *HHI* and *FSTS* is 0.439 (0.463) and 0.348 (0.312) respectively. The international diversification measures suggest that the sample firms are reasonably well diversified. The mean (median) value of market value of equity (*MV*) is $4,144 million ($801 million). The institutional investor holdings (*IH*) have the mean value of 51.5%. The mean of *BM* is 0.463. The mean (median) value of the number of business segments disclosed is 2.184(1). The distribution of the control variables is comparable to those reported in prior PEAD studies.

4.2. *Correlations*

Pearson and Spearman correlations are reported in Table 3. The serial correlation of *SUE_AF* is 24.2% (Pearson) and 24.3% (Spearman), respectively. The magnitudes of these serial correlations are comparable to those reported in prior studies (e.g., Livnat and Mendenhall 2006). The Pearson correlations between SUE_AF_t and the abnormal return measures range from 0.084 (*BHAR_BL_60*) to 0.119 (*BHAR_MKT_60*). A similar pattern is observed for the Spearman correlations, which range from 0.088 (*BHAR_BL_60*) to 0.134 (*BHAR_MKT_60*). The Pearson correlations between *HHI* and *NUM_GEO*, *FSTS* and *ID* are 0.600, 0.683, and 0.933 respectively, lending reasonable assurance that these measures capture the similar underlying construct, international diversification. The correlations of international diversification variables

(*HHI* or *FSTS*) with *MV, PRICE, VOLUME*, and *IH* are relatively small in magnitude, suggesting that the international diversification proxies are unlikely to be capturing the size effect or other factors such as investor sophistication and transaction costs that could affect the drift.

[Insert Table 3]

4.3. *The impact of international diversification on the serial correlation of SUE_AF*

Table 4 reports the regression results of estimating model (5) quarter-by-quarter for the full sample period as well as for the pre- and post-131 periods. Specifically, we report the mean values of coefficient estimates obtained from quarter-by-quarter estimations along with the Fama-Macbeth (1973) t-statistics testing that the mean of the quarterly coefficients is equal to zero. There are 36 and 62 quarterly estimations for the pre- and post SFAS 131 periods, respectively.

[Insert Table 4]

The coefficients on SUE_AF_{t-1} are positive and statistically significant at the 0.01 level in all columns, which are consistent with prior findings that analysts under-react to the information contained in prior quarter's earnings in forming current quarter's earnings expectation (Mendenhall 1991; Abarbanell and Bernard 1992). In column (1), the coefficient β_3 on $SUE\_AF_{t-1}*DHHI_t$ is positive (0.0113) and statistically insignificant at the 0.10 level. In column (2), the coefficient β_3 on $SUE\_AF_{t-1}*DHHI_t$ is positive (0.0643) and statistically significant at the 0.01 level, suggesting that analysts' under-reaction to prior earnings information increases with corporate international diversification in the pre-SFAS 131 period. This result supports Hypothesis H1. In contrast, the coefficient β_3 on $SUE\_AF_{t-1}*DHHI_t$ is -0.0194 and statistically insignificant in column (3), suggesting that international diversification has no significant impact on the serial correlation of analyst forecast errors in the post-SFAS 131 period. Column (4) shows that the difference in the mean (median) of β_3 between the pre- and post-SFAS 131 periods is statistically significant, with a t-statistic (z-statistic) of 3.24 (3.25). This result suggests that the implementation of SFAS 131 mitigates and even eliminates the impact of international diversification on the serial correlation of analyst forecast errors.

4.4. *The impact of international diversification on the drift based on SUE_AF*

Table 5 presents the association between international diversification and the drift. Similar to Table 4, we report the results separately for the full sample period, the pre- and post-SFAS 131 periods. Panels A, B and C reports the results for three alternative measures of the *BHAR*, i.e., *BHAR_MKT_60*, *BHAR_FF3_60*, and *BHAR_BL_60*.

[Insert Table 5]

In Panel A, the dependent variable is *BHAR_MKT_60*. The coefficients on SUE_AF_t are all positive and significant at the 0.01 level. The drift is generally comparable in magnitude with those observed in prior studies, as surveyed in section 2.1. These results suggest that the PEAD phenomenon based on analyst forecast errors exist in our sample. In column (1) of Panel A, the coefficient on $SUE\_AF_t*DHHI_t$ is positive (0.0206) and statistically significant at the 0.05 level. In column (2) of Panel A, the coefficient on $SUE\_AF_t*DHHI_t$ is positive (0.0492) and statistically significant at the 0.01 level, providing supporting evidence for hypothesis H2 that international diversification exacerbates investors' under-reaction to earnings information contained in analyst forecast errors. However, the coefficient on $SUE\_AF_t*DHHI_t$ in column (3) is statistically insignificant at the conventional level. These results suggest that the magnitude of PEAD based on analysts' forecast errors increases in international diversification in the pre-SFAS 131 period but not in the post-SFAS 131 period. Furthermore, the difference in both mean and median of the coefficient on $SUE\_AF_t*DHHI_t$ between the pre- and post- SFAS 131 periods, as reported in Column (4), is significant at the 0.05 level, suggesting that the implementation of SFAS 131 mitigates and even eliminates the impact of international diversification on the PEAD when the earnings surprises are measured as analyst forecast errors.

The results based on the alternative return measures, reported in Panel B for *BHAR_FF3_60* and Panel C for *BHAR_BL_60*, are qualitatively similar. These results add confidence that the documented association between international diversification and PEAD is not sensitive to the abnormal return measures.

4.5. *Portfolio tests*

Table 6 presents the portfolio returns for portfolios sorted by the magnitude of earnings surprises and international diversification. We measure the portfolio returns (the average *BHAR* for firms in that portfolio) over the period of 60 trading days after quarter t's earnings announcement. The portfolio returns are reported separately for the pre- and post-SFAS 131 periods.

Firm-quarter observations are independently sorted into five international diversification groups and five *SUE* groups. Specifically, we rank all firm-quarter observations into five *HHI* quintiles from lowest *HHI* to highest *HHI*. We also independently classify all firm-quarter observations into five *UE_AF* quintiles from lowest *UE_AF* to highest *UE_AF*: 5 being the highest and 1 being the lowest. For each *HHI* quintile, we report the portfolio returns from the lowest and to the highest *UE_AF* quintiles, and the difference in the portfolio returns between the lowest and highest *UE_AF* quintiles. The difference represents the abnormal returns earned from an investment strategy of a long position on all firms with largest analyst forecast errors and a short position on all firms with the smallest analyst forecast errors.

Panel A reports the results using *BHAR_MKT_60*, the market portfolio-based measure of *BHAR*. In the pre-SFAS 131 period, the hedge portfolio return (the return difference across the highest and lowest *UE_AF* portfolios) is 0.0490 (0.0334 – [-0.0156]), 0.0493, 0.0707, 0.0666, and 0.0821 for *HHI* quintiles 1 (lowest quintile), 2, 3, 4, and 5 (highest quintile) respectively. This nearly monotonic increase in the hedge portfolio returns suggests that the trading strategies based on the analyst forecast errors increase in the magnitude of international diversification during the pre-SFAS 131 period. The difference in the hedge portfolio returns between lowest quintile and highest quintile of *HHI* is 3.31% (0.0821 – 0.0490). In the post-SFAS 131 period, we find the return difference across the highest and lowest *UE_AF* portfolios is 0.0799, 0.0859, 0.0797, 0.0858, and 0.0847 for *HHI* quintiles 1, 2, 3, 4, and 5 respectively. Further, the difference in the hedge portfolio returns between lowest quintile and highest quintile of *HHI* is -0.48% (0.0847 – 0.0799). These results suggest that there are no incremental abnormal returns from exploring international diversification to the PEAD trading strategies based on *UE_AF* in the post-SFAS 131 period.

The results in Panel B based on *BHAR_FF3_60* show a similar pattern. In the pre-SFAS 131 period, the return difference across the highest and lowest *UE_AF* portfolios is 0.0352, 0.0570, 0.0690, 0.0798, and 0.0743 for *HHI* quintiles 1, 2, 3, 4, and 5 respectively. The difference in the hedge portfolio returns between lowest quintile and highest quintile of *HHI* is 3.91%. In the post-SFAS 131 period, we find the return difference across the highest and lowest *UE_AF* portfolios is 0.0827, 0.0814, 0.0783, 0.0855, and 0.0871 for *HHI* quintiles 1, 2, 3, 4, and 5 respectively. The difference in the hedge portfolio returns between lowest quintile and highest quintile of *HHI* is -0.44% (0.0871 – 0.0827).

Panel C reports the results using *BHAR_BL_60*, the *BHAR* based on the Barber and Lyon (1997) control firm approach. In the pre-SFAS 131 period, the return difference across the highest and lowest *UE_AF* portfolios is 0.0467, 0.0528, 0.0791, 0.0761, and 0.1095 for *HHI* quintiles 1, 2, 3, 4, and 5 respectively. The difference in the hedge portfolio returns between lowest quintile and highest quintile of *HHI* is 6.28%. In the post-SFAS 131 period, we find the difference in buy-and-hold abnormal returns across the highest and lowest *UE_AF* portfolios is 0.0813, 0.0841, 0.0871, 0.0844, and 0.0827 for *HHI* quintiles 1, 2, 3, 4, and 5 respectively. The difference in the hedge portfolio returns between lowest quintile and highest quintile of *HHI* is -0.14% (0.0827 – 0.0813).

In sum, our portfolio tests are consistent with our regression tests. When trading strategy is based on analyst forecast errors, the hedge portfolio returns increase for portfolios formed on the basis of international diversification in the pre-SFAS 131 period. However, this pattern is not observed in the post-SFAS 131 period.

[Insert Table 6]

4.6. Additional tests

4.6.1. Use of a constant sample

The results reported up to this point are based on the "full sample" of firms. While the use of the full sample increases the power of tests, its use is subject to the concern of correlated omitted variables for the tests comparing the two corresponding coefficients across the two accounting regimes, especially if there is an unequal representation in the two time periods – pre- and post- SFAS 131. To address this concern, we restrict out tests to those firms that appear in both periods and re-estimate our models using the "constant sample."[16]

[16] We do not require firms to have observations in all the sample years to alleviate the survivorship bias.

Table 7 presents the association between international diversification and the serial correlation of *SUE_AF* and drift based on *SUE_AF* for the constant sample. Panel A reports the regression results of the serial correlation of *SUE_AF*.

[Insert Table 7]

In column (1), the coefficient β_3 on $SUE\_AF_{t-1}*DHHI_t$ is -0.0046 and statistically insignificant at the 0.10 level. In column (2), the coefficient β_3 on $SUE\_AF_{t-1}*DHHI_t$ is positive (0.0460) and statistically significant at the 0.05 level. In contrast, the coefficient β_3 on $SUE\_AF_{t-1}*DHHI_t$ is -0.0340 and statistically insignificant in column (3). Column (4) shows that there is a significant difference in the mean (median) of β_3 between pre- and post-SFAS 131, with a t-statistic (z-statistic) of 2.64 (2.38).

Panel B presents the association between international diversification and the drift using three alternative measures of *BHAR*s. For the sake of brevity, we focus on the first three columns, where the dependent variable is *BHAR_MKT_60*. In column (1), the coefficient on $SUE\_AF_t*DHHI_t$ is positive (0.0474) and statistically significant at the 0.01 level, providing supporting evidence for hypothesis H2 that international diversification exacerbates investors' under-reaction to earnings information contained in analyst forecast errors. In column (2), the coefficient on $SUE\_AF_t*DHHI_t$ is negative (-0.0059) and statistically insignificant at the 0.10 level. Furthermore, the difference in both mean and median of the coefficient on $SUE\_AF_t*DHHI_t$ between the pre- and post- SFAS 131 is significant at the 0.10 and 0.05 level, respectively, suggesting that the implementation of SFAS 131 mitigates and even eliminates the impact of international diversification on the PEAD. The results based on the alternative return measures, *BHAR_FF3_60* in columns 4-6 and *BHAR_BL_60* in columns 7-9 show a similar pattern. Overall, the results based on the constant sample are consistent with those of the full sample.

4.6.2 The impact of international diversification on the serial correlation and PEAD based on seasonal random walk based earnings surprises (*UE_RW*)

We also examine whether international diversification affects the serial correlation of standardized seasonal random walk based earnings surprises (*SUE_RW*) and the associated drift by replicating all the tests we do using *SUE_AF*.[17] For brevity, we do not tabulate the results relating to *SUE_RW*; instead we summarize what we find. For the serial correlation test, consistent with prior studies, the coefficients on SUE_RW_{t-1} are positive and statistically significant at the 0.01 level. However, the coefficients β_3 on $SUE\_RW_{t-1}*DHHI_t$ are statistically insignificant at the 0.10 level for both the pre-SFAS 131 and the post-SFAS 131 periods. For the PEAD test, we find that the coefficients on SUE_RW_t are all positive and significant at the 0.01 level, suggesting that the PEAD phenomenon based on seasonally differenced earnings exists in our sample. For all three measures of *BHAR*s and the pre-SFAS 131 and the post-SFAS131 periods, we find that the coefficient on $SUE\_RW_t*DHHI_t$ is statistically insignificant for all specifications except for *BHAR_BL_60* in the pre-SFAS 131 period. These results add confidence that the documented association of international diversification with the serial correlation of analyst forecast errors, and the corresponding drift in the pre-SFAS 131 period is likely due to the inefficiency of analyst earnings forecasts, rather due to the actual earnings reported by international diversification firms.

4.6.3 The impact of international diversification on the forecast bias

[17] Analogous to *SUE_AF*, we derive earnings surprise deciles, S*UE_RW*, using *UE_RW* defined as $(EPS_t - EPS_{t-4})/P_t$ where EPS_t is the actual quarterly earnings per share for quarter t, EPS_{t-4} is the quarterly earnings per share of the same quarter of previous year, and P_t is the stock price at the end of quarter t.

To explore the potential channel of how international diversification affects the serial correlation of earnings surprises based on analyst earnings forecasts, we examine the relation between international diversification and forecast bias. The argument is that the biased earnings forecasts, rather than merely less accurate forecasts, are likely to cause the serial correlation of earnings surprises. In contrast, less accurate, but unbiased forecasts are likely to reduce the serial correlation in earnings surprises since a large surprise in one quarter may be followed by a large surprise in the opposite direction in the following quarter. Duru and Reeb (2002) find, over the four-year period between 1995 and 1998, that international diversification is associated with not only less accurate but also greater analyst earnings forecast optimism. Their evidence is consistent with financial analysts issuing more optimistic earnings forecasts for firms with less predictable earnings streams (Das et al. 1998), because of firms' operations in multiple jurisdictions with different legal, economic, and cultural environments.

Prior studies also show that SFAS 131 improved the quality of segment reporting in general (Berger and Hann 2003) and geographic segment reporting in particular (Herrmann and Thomas 2000; Street et al. 2000), leading to improvements in analyst earnings forecast accuracy of firms with geographically diverse operations (Behn et al. 2002). In addition to the improved earnings predictability, the improved mandatory reporting under SFAS 131 also provides more public information to investors, thus reducing the incentives of analyst to issue optimistically biased forecasts to access management's private information. Therefore, we expect the positive relation between international diversification and forecast bias is less pronounced in the post- relative to that in the pre-SFAS 131 period.

We define earnings forecast bias (*BIAS_AF*) as the median forecast in the 90-day period before the earnings announcement date minus actual earnings per share from I/B/E/S, scaled by price per share. To explore whether it is the outcome rather the forecasts that drive the serial correlation in analyst forecast errors, we examine the forecast bias based on random walk model (*BIAS_RW*). *BIAS_RW* is measured as the negative of earnings per share before extraordinary items minus earnings per share in the same quarter of the prior year, scaled by the price per share. We then regress each forecast bias variable on several independent variables separately for the Pre-SFAS 131 and Post-SFAS 131 time periods. Following Duru and Reeb (2002), the independent variables we use are *HHI*, *SIZE* (the natural logarithm of market value of equity), *NUM_BUS* (the number of business segments reported on Compustat segment file), *STDROA* (the standard deviation of return on assets over the preceding five years), *LOSS* (an indicator variable that takes the value of 1 if the company had negative return on assets, 0 otherwise), *NANA* (the natural logarithm of number of analysts providing an annual earnings forecast), and *DISP* (the standard deviation of analysts' earnings forecasts scaled by the stock price at the end of the prior fiscal quarter).

[Insert Table 8]

Table 8 presents the regression results for the Pre-SFAS 131 and Post-SFAS 131 periods using *BIAS_AF* and *BIAS_RW* as dependent variables. There is a positive association between international diversification and analyst earnings forecast bias in the pre-SFAS 131 period, but this positive association disappears in the post-SFAS 131 period. Specifically, the coefficient on *HHI* is 0.0014 ($t = 3.70$) in the pre-SFAS 131 period, but decreases to 0.0001 ($t = 0.41$) in the post-SFAS 131 period. The difference in the analyst forecast bias in the pre- and post-SFAS 131 periods is significant at the 0.01 level for both the means and the medians of the quarterly regression coefficients. In contrast, no similar pattern is observed for the forecast bias based on the random walk model. For the forecast bias based on the random walk model, the coefficient on *HHI* is insignificant in the pre-SFAS 131 period, with a coefficient of 0.0015 (t = 1.28) but it turns marginally significant with a coefficient of 0.0016 (t = 1.87) in the post-SFAS 131 period. The differences in the means and medians are insignificant between the pre- and the post-SFAS 131 periods.

Overall, the results in Table 8 provide empirical support for our conceptual development and show that there is a greater analyst forecast bias for firms that have higher international diversification and this bias became smaller after the implementation of SFAS 131. Furthermore, the same bias does not exist for time-series forecasts. The results based on both analyst and time-series forecast biases suggest that it is the forecasts, not the outcome, that drive the serial correlation in analyst forecast errors.

4.6.4 Short-window tests

Given the length of the time period used in our study, other confounding events can potentially affect the information environment and may drive the results reported in Tables 4 and 5. Herrmann et al. (2008) argue that Regulation Fair Disclosure (Reg FD) and the Sarbanes-Oxley Act of 2002 (SOX) could reduce analysts' incentives to issue optimistic forecasts. Consistent with this argument, they find that the positive relation between forecast optimism and international diversification significantly declines in the post-Reg FD period and this Reg FD effect may have been reinforced by the passage of SOX. To bolster the evidence on causality and to alleviate the concern of potential confounding effect, we perform two short-window tests: 1) we confine the event window to two years before SFAS 131 and two years after SFAS 131 but before the effective date of Reg FD (we use the fiscal quarter end date of December 31, 2000 as the cutoff); 2) we confine the event window to two years before and after the effective date of Reg FD.

Consistent with the idea that SFAS 131 systematically impacted the information environment of analysts following internationally diversified firms, untabulated results show that the impact of international diversification on both the serial correlation of earnings surprises and PEAD significantly decreases from the pre- to the post-SFAS 131 periods. In contrast, for the analysis using short-window surrounding the Reg FD, untabulated results show that the impact of international diversification on both the serial correlation of earnings surprises and PEAD does not significantly decrease from the pre- to the post-Reg FD period. A possible explanation is that while Reg FD reduces forecast bias for an average firm, but the effect of SFAS 131 is more applicable to internationally diversified firms.

Overall, these results add confidence that SFAS 131 plays an important role in the decreasing trend of the association between international diversification and the serial correlation of earnings surprises and its associated drift.

4.6.5 Use of alternative measures of international diversification

In this section, we test the sensitivity of our results to two alternative proxies of international diversification: *FSTS* computed as the ratio of foreign sales of the total sales and *ID* derived as the principal component of *HHI* and *FSTS*. While *FSTS* proxies for the intensity of international diversification, *ID* proxies for both extent and diversity of international diversification. For brevity, we do not tabulate results for the two alternative proxies. We continue to find the serial correlation of standardized earnings surprises based on analyst forecasts significantly increases with international diversification in the pre-SFAS 131 period, but not in the post-SFAS 131 period. Similarly, there is a significant positive association between international diversification and the drift in the pre-SFAS 131 but not in the post- SFAS 131 periods. Overall, these results suggest that alternative measures of international diversification other than *HHI* yield similar implications.

4.6.6 Use of the line of business disclosures and other variables as additional controls

Several studies find that the number of business segments disclosed increased after the implementation of SFAS 131 (Herrmann and Thomas 2000; Street et al. 2000; Berger and Hann 2003). Prior studies find that the information environment also improved after firms disclosed business segment information under SFAS 131 (Berger and Hann 2003; Botosan and Stanford 2005; Ettredge et al. 2005). In light of these studies, we examine whether our inferences are affected after controlling for business segment reporting. We measure business segments using the natural logarithm of the number of business segments and replicate our tests in Tables 4 and 5 by including a main effect for the industry segment reporting variable together with its interaction with *SUE_AF*. Untabulated results indicate that our results for the international diversification are robust to the additional controls included in our regression models (5) and (6), suggesting that the results reported in Tables 4 and 5 are not due to a lack of control for business segment reporting.

In addition, we test the robustness of both serial correlation and drift results to the inclusion of several additional controls variables: (1) analyst following (*AFOLLOW*), the number of analysts issuing an earnings forecast; (2) firm age (*AGE*), the number of years the firm has been on CRSP at the start of year t; and (3) earnings volatility (*EARN_VOL*), the standard deviation of the most recent eight quarterly earnings (including quarter t) scaled by average total assets. There variables are shown in prior research to be associated with forecast accuracy or earnings predictability (Lang and Lundholm 1996; Alford and Berger 1999; Berger and Hann 2003; Dichev and Tang 2009; Cao and Narayanamoorthy 2012). In the drift test, we also follow

Mendenhall (2004) and Mashruwala et al. (2006) to control for the arbitrage costs (*ARBRISK*). The arbitrage costs are measured as the standard deviation of residuals from a market model regression of its stock returns on the equal-weighted market index over 48 months ending one month prior to the quarterly earnings announcement date. We rank each of these variables into deciles and further scale them to range between zero and one. We include the main variable and its interaction terms one at a time. Our results are robust to these additional controls.

5. Conclusion

In this paper, our evidence suggests that international diversification exacerbates analysts' under-reaction to the earnings information and more internationally diversified firms experience more PEAD based on analyst forecast errors. However, the implementation of SFAS 131 mitigates the impact of international diversification on PEAD based on analysts forecast errors. In the pre-SFAS 131 time period, trading rules that exploits international diversification generate incremental abnormal returns to the trading strategy of PEAD based on analyst forecast errors. However, this investment strategy results in less incremental trading benefits in the post-SFAS 131 time period. Overall, our results indicate that disclosures under SFAS 131 were informative in helping analysts forming efficient earnings expectations, and thereby helping capital markets in pricing earnings of internationally diversified firms.

References

Abarbanell, J., and V. Bernard. 1992. Tests of Analysts' Overreaction/Underreaction to Earnings Information as an Explanation for Anomalous Stock Price Behavior. *Journal of Finance* 47 (3):1181-1207.

Alford, A., and P. Berger. 1999. A Simultaneous Equations Analysis of Forecast Accuracy, Analyst Following and Trading Volume. *Journal of Accounting Auditing and Finance* 14 (3): 219-240.

Amihud, Y. and B. Lev. 1981. Risk Reduction as a Managerial Motive for Conglomerate Mergers. *Bell Journal of Economics* 12 (2): 605-617.

Ayers, B., O. Li, and P. Yeung. 2011. Investor Trading and the Post Earnings Announcement Drift. *The Accounting Review* 86 (2): 385-416.

Baber, W., and S. Kang. 2002. The impact of split adjusting and rounding on analysts' forecast error calculations. *Accounting Horizons* 16 (4): 277–90.

Balakrishnan, K., E. Bartov, and L. Faurel. 2010. Post loss/profit announcement drift. *Journal of Accounting and Economics* 50 (1):20-41.

Ball, R., and E. Bartov. 1996. How Naive is the Stock Market's Use of Earnings Information? J*ournal of Accounting and Economics* 21 (3):319-337.

Ball, R., and P. Brown. 1968. An Empirical Evaluation of Accounting Income Numbers. *Journal of Accounting Research* 6 (2):159-178.

Ball, R., S Kothari, R Watts. 1993. Economic determinants of the relation between earnings changes and stock returns. *The Accounting Review* 68: 622–638.

Barber, B., R. Lehavy, M. McNichols, and B. Trueman. 2006. Buys, Holds, and Sells: The Distribution of Investment Banks' Stock Ratings and the Implications for the Profitability of Analysts' Recommendations. *Journal of Accounting and Economics*, 41 (1-2): 87-117.

Barber, B., and J. Lyon. 1997. Detecting Long-Run Abnormal Stock Returns: The Empirical Power and Specification of Test Statistics. J*ournal of Financial Economics* 43: 341–72.

Bartov, E., 1992. Patterns in Unexpected Earnings as an Explanation for Post-Earnings Announcement Drift. *The Accounting Review* 67 (3): 610 - 622.

Bartov, E., and G. Bodnar. 1994. Firm valuation, earnings expectations and the exchange-rate effect. *Journal of Finance* 49: 1755–1785.

Bartov, E., S. Radhakrishnan, and I. Krinsky. 2000. Investor Sophistication and Patterns in Stock Returns after Earnings Announcements. T*he Accounting Review* 75 (1):43-63.

Basu, S., S. Markov, and L. Shivakumar. 2010. Inflation, earnings forecasts, and post-earnings announcement drift. *Review of Accounting Studies* 15 (2): 403-440.

Battalio, R., and R. Mendenhall. 2005. Earnings Expectations, Investor Trade Size, and Anomalous Returns Around Earnings Announcements. *Journal of Financial Economics* 77: 289-319.

Behn, B., N. Nichols and D. Street. 2002. The Predictive Ability of Geographic Segment Disclosures by U.S. Companies: SFAS No. 131 vs. SFAS No. 14. *Journal of International Accounting Research* 1: 31-44.

Bernard, V., and J. Thomas. 1989. Post-Earnings-Announcement Drift: Delayed Price Response or Risk Premium? *Journal of Accounting Research* 27:1-36.

———. 1990. Evidence That Stock Prices do not Fully Reflect the Implications of Current Earnings for Future Earnings. *Journal of Accounting and Economics* 13 (4):305-340.

Berger, P., and R. Hann. 2003. The Impact of SFAS No. 131 on Information and Monitoring. *Journal of Accounting Research* 41: 163-223.

Bhushan, R., 1994. An Informational Efficiency Perspective on the Post-earnings Announcement Drift. *Journal of Accounting and Economics* 18: 45-65.

Botosan, C., and M. Stanford. 2005. Managers' Motives to Withhold Segment Disclosures and the Effect of SFAS No. 131 on Analysts' Information Environment. *The Accounting Review* 80(3): 751-771.

Bradshaw, M., L. Lee, and K. Peterson. 2015. The Interactive Role of Difficulty and Incentives in Explaining the Annual Earnings Forecast Walkdown. working paper. Boston University.

Burgman, T., 1996. An Empirical Examination of Multinational Capital Structure. *Journal of International Business Studies* 27: 553-570.

Calegari, M., *and* N. L. Fargher. 1997. Evidence that prices do not fully reflect the implications of current earnings for future earnings: an experimental market approach. *Contemporary Accounting Research* 14 (3): 397–433.

Callen, J., O.-K. Hope, and D. Segal. 2005. Domestic and Foreign Earnings, Stock Return Volatility, and the Impact of Investor Sophistication. *Journal of Accounting Research* 43 (3): 377-412.

Cao, S., and G. Narayanamoorthy. 2012. Earnings Volatility, Post-Earnings-Announcement Drift, and Trading Frictions. *Journal of Accounting Research* 50: 41-74.

Chen, C. 2013. Time-Varying Earnings Persistence and the Delayed Stock Return Reaction to Earnings Announcements. *Contemporary Accounting Research* 30 (2): 549-578.

Chordia, T., A. Goyal, G. Sadka, R. Sadka, and L. Shivakumar. 2009. Liquidity and post-earnings announcement-drift. *Financial Analyst Journal* 65 (4): 18–33.

Chung, D. Y., *and* K. Hrazdil. 2011. Market efficiency and the post-earnings-announcement drift. *Contemporary Accounting Research* 28 (3): 926–56.

Das, S., C. Levine, and K. Sivaramakrishnan. 1998. Earnings predictability and bias in analysts' earnings forecasts. *The Accounting Review* 73 (2): 277-294.

Denis, D., D. Denis, and A. Sarin. 1997. Agency Problems, Equity Ownership, and Corporate Diversification. *Journal of Finance* 52: 135-160.

Denis, D., D. Denis, and K. Yost. 2002. Global Diversification, Industrial Diversification and Firm Value. *Journal of Finance* 57(5): 1951-1979.

Dichev, I. and V. Tang. 2009. Earnings Volatility and Earnings Predictability. *Journal of Accounting and Economics* 47: 160-181.

Diether, K., C. Malloy, and A. Scherbina. 2002. Differences of opinion and the cross section of stock returns. *Journal of Finance* 57 (5): 2113–41.

Doyle, J., J. Russell, and M. Soliman. 2006. The Extreme Future Stock Returns Following I/B/E/S Earnings Surprises. *Journal of Accounting Research* 44 (5): 849-887.

Doupnik, T., and L. Seese. 2001. Geographic Area Disclosures Under SFAS 131: Materiality and Fineness. *Journal of International Accounting, Auditing and Taxation* 10(2): 117-138.

Duru, A., and D. Reeb. 2002. International Diversification and Analysts' Forecast Accuracy and Bias. *The Accounting Review* 77 (2): 415-433.

Egelhoff, W. 1991. Information-Processing Theory and the Multinational Enterprise. *Journal of International Business Studies* 22: 341-358.

Ettredge, M., S., Kwon, D., Smith, and P. Zarowin. 2005. The impact of SFAS no. 131 business segment data on the market's ability to anticipate future earnings. The Accounting review 80 (3):773–804.

Fama, E., French, K., 1996. Multifactor explanations of asset pricing anomalies. *Journal of Finance* 51, 55–84.

Fama, E., and J. MacBeth. 1973. Risk, Return, and Equilibrium: Empirical Tests. Journal of Political Economy 81 May/June: 607–636.

Financial Accounting Standards Board (FASB). 1997. Disclosures About Segments of an Enterprise and Related Information. Statement of Financial Accounting Standards No. 131. Stamford, CT: FASB.

Foster, G., C. Olsen, and T. Shevlin. 1984. Earnings Releases, Anomalies and the Behavior of Security Returns. *The Accounting Review* 59: 574-603.

Francis, J., R. LaFond, P. Olsson, and K. Schipper. 2007. Information uncertainty and post earnings-announcement-drift. *Journal of Business Finance & Accounting* 34 (3–4): 403–33.

Francis, J., and D. Philbrick. 1993. Analysts' decisions as products of a multi-task environment. *Journal of Accounting Research* 31 (2): 216-230.

Freeman, R., and S. Tse. 1989. The Multiperiod Information Content of Accounting Earnings: Confirmations and Contradictions of Previous Earnings Reports. J*ournal of Accounting Research* 27:49-79.

Goldberg. S., and F. Heflin. 1995. The Association between the Level of International Diversification and Risk. J*ournal of International Financial Management and Accounting* 6 (1): 1-25.

Haskins, M., K. Ferris, and T. Selling. 2000. I*nternational Financial Reporting and Analysis*. 2nd edition. Irwin McGraw-Hill, Boston.

Herrmann, D., O. Hope, and W. Thomas. 2008. International Diversification and Forecast Optimism: The Effects of Reg FD. *Accounting Horizons* 22(2): 179-197.

Herrmann, D., and W. Thomas. 2000. An Analysis of Segment Disclosures Under SFAS No. 131 and SFAS No. 14. *Accounting Horizons* 14 (3): 287-302.

Hope, O.-K., T. Kang, W. Thomas, and F. Vasvari, 2008. Pricing and mispricing effects of SFAS 131. *Journal of Business, Finance and Accounting* 35 (3–4): 281–306.

Hope, O.-K., T. Kang, W. Thomas and F. Vasvari. 2009. The Effects of SFAS 131 Geographic Segment Disclosures by U.S. Multinational Companies on the Valuation of Foreign Earnings. 2009. *Journal of International Business Studies* 40 (3): 421-443.

Hung, M., X. Li, and S. Wang. 2014. Post-Earnings Announcement Drift in Global Markets: Evidence from an Information Schck. *Review of Financial Studies* (forthcoming).

Hughes, J., J. Liu, and W. Su. 2008. On the Relation between Predictable Market Returns and Predictable Analyst Forecast Errors. *Review of Accounting Studies* 13 (2/3): 157-182.

Jensen, M.C. 1986. Agency Costs of Free Cash Flow, Corporate Finance and Takeovers. *American Economic Review* 76 (2): 323-329.

Jiang, G., C. Lee, and Y. Zhang. 2005. Information uncertainty and expected returns. *Review of Accounting Studies* 10 (2–3): 185–221.

Kothari, S., J. Sabino, and T. Zach. 2005. Implications of Survival and Data Trimming for Tests of Market Efficiency. *Journal of Accounting & Economics* 39:129-161.

Khurana, I., R. Pereira, and K. Raman. 2003. Does Analyst Behavior Explain Market Mispricing of Foreign Earnings for U.S. Multinational Firms? *Journal of Accounting, Auditing, and Finance* (3): 453-477.

Kim, W., and R. Mauborgne. 1995. A Procedural Justice Model of Strategic Decision Making: Strategy Content Implications in the Multinational. *Organizational Science* 6: 44-61.

Kimbrough, M., 2005. The Effect of Conference Calls on Analyst and Market Underreaction to Earnings Announcements. *The Accounting Review* 80 (1): 189-219.

Kothari, S., 2001. Capital Markets Research in Accounting. *Journal of Accounting and Economics* 31(1-3): 105-231.

Kumar, K. 2009. Hard-to-value stocks, behavioral biases, and informed trading. *Journal of Financial and Quantitative Analysis* 44:1375–401.

Kunda, Z. 1990. The case for motivated reasoning. Psychological Bulletin 108 (3): 480-498.

Lang, M, and R. Lundholm. 1996. Corporate Disclosure Policy and Analyst Behavior. *The Accounting Review* 71 (4): 467-492.

Lim, T. 2001. Rationality and analysts' bias *Journal of Finance* 56 (2): 369-385.

Livnat, J., and R. Mendenhall. 2006. Comparing the Post-Earnings Announcement Drift for Surprises Calculated from Analyst and Time-Series Forecasts. J*ournal of Accounting Research* 44 (1): 177–205.

Markov, S., and A. Tamayo. 2006. Predictability in Financial Analyst Forecast Errors: Learning or Irrationality? *Journal of Accounting Research* 44:725-761.

Mashruwala, C., S., Rajgopal, and T., Shevlin, 2006. Why is the Accrual Anomaly not Arbitraged Away? The Role of Idiosyncratic Risk and Transaction costs. *Journal of Accounting and Economics* 42: 3-33.

Mendenhall, R. 1991. Evidence of Possible Underweighting of Earnings-Related Information. Jo*urnal of Accounting Research* 29 (1): 170–80.

Mendenhall, R. 2002. How naïve is the market's use of firm-specific earnings information? *Journal of Accounting Research* 40 (3): 841–63.

Mendenhall, R. 2004. Arbitrage risk and post-earnings-announcement drift. *The Journal of Business* 77 (4): 875–94.

Narayanamoorthy, G., 2006. Conservatism and Cross-Sectional Variation in the Post-Earnings Announcement Drift. *Journal of Accounting Research* 44 (4):763-789.

Ng, J., T. Rusticus, and R. Verdi. 2007. Implications of Trading Costs for Post-earnings-Announcement Drift. *Journal of Accounting Research* 46 (3): 661-696.

Nichols, N., D. Street, L, Gray, and J. Sidney. 2000. Geographic Segment Disclosures in the United States: Reporting Practices Enter a New Area. *Journal of International Accounting, Auditing, and Taxation* 9: 59-82.

Ogneva, M., Subramanyam, K.R., 2007. Does the stock market underreact to going concern opinions? Evidence from the US and Australia. *Journal of Accounting and Economics* 43, 439–462.

Payne, J., and W. Thomas. 2003. The implications of using stock split adjusted I/B/E/S data in empirical research. *The Accounting Review* 78 (4): 1049–67.

Penrose, E. 1959. The Theory of the Growth of the Firm. Oxford: Oxford University.

Rangan, S., and R. Sloan. 1998. Implications of the Integral Approach to Quarterly Reporting for the Post-Earnings-Announcement Drift. *The Accounting Review* 73 (3): 353 - 371.

Reeb, D., Kwok, C., and Y. Baek. 1998. Systematic Risk in the Multinational Corporation. *Journal of International Business Studies* 29 (2): 263-279.

Reeb, D., S.A. Mansi, and J.M. Allee. 2001. Firm Internationalization and the Cost of Debt Financing: Evidence from Non-Provisional Publicly Traded Debt. J*ournal of Financial and Quantitative Analysis* 36 (3): 395-414.

Rendleman, R., C. Jones, and H. Latane. 1987. Future Insight into the Standardized Unexpected Earnings Anomaly: Size and Serial Correlation Effects. *Financial Review* 22 (1):131-144.

Shumway, T., 1997. The delisting bias in CRSP data. *Journal of Finance* 52, 327–340.

Soffer, L., and T. Lys. 1999. Post-Earnings Announcement Drift and the Dissemination of Predictable Information. *Contemporary Accounting Research* 16 (2): 305-340.

Street, D., N. Nichols and S. Gray. 2000. Segment Disclosures Under SFAS No. 131: Has business segment reporting improved? *Accounting Horizons* 14 (3): 259-285.

Stultz, R.M. 1981. On the Effects of Barriers to International Investment. *Journal of Finance* 36 (4): 923-934.

Tan, H., S. Wang, and M. Welker. 2011. Analyst Following and Forecast Accuracy After Mandatory IFRS Adoptions. *Journal of Accounting Research* 49 (5): 1307-1357.

Thomas, S. 2002. Firm Diversification and Asymmetric Information: Evidence from Analysts' Forecasts and Earnings Announcements. *Journal of Financial Economics* 64 (3): 373-396.

Thomas, W. 1999. A Test of the Market's Mispricing of Domestic and Foreign Earnings. *Journal of Accounting and Economics* 28 (3): 243-267.

Walther, B. 1997. Investor Sophistication and Market Earnigns Expectations. *Journal of Accounting Research* 35: 157-192.

You, H. 2014. Valuation-Driven Profit Transfer among Corporate Segments. *Review of Accounting Studies 19* (2): 805–838.

Table 1
Sample selection and sample distribution by fiscal year

Panel A: Sample selection criteria.

	# of Firm-quarters	# of Firms
Firms with at least 9 observations of quarterly data on Compustat and returns data on CRSP for the years 1990 to 2013	366,301	9,626
After deleting observations with no foreign sales	138,427	4,285
After removing observations with no analyst forecast data	101,229	3,865
After removing quarters 3 and 4 of 2013 due to small number of observations	100,908	3,863
After deleting observations without institutional holding (Full sample)	98,548	3,815
After imposing firms to be in both pre- and post-F131 periods (Constant sample)	56,684	1,295

Panel B. Sample distribution by fiscal year.

Year	N	*NUM_GEO*		*HHI*		*FSTS*		*ID*	
		Mean	Median	Mean	Median	Mean	Median	Mean	Median
1990	1719	2.752	3.000	0.377	0.396	0.282	0.260	-0.308	-0.286
1991	2116	2.726	3.000	0.374	0.384	0.279	0.251	-0.322	-0.341
1992	2310	2.736	3.000	0.380	0.391	0.287	0.253	-0.289	-0.327
1993	2469	2.778	3.000	0.371	0.371	0.277	0.242	-0.334	-0.396
1994	3012	2.768	3.000	0.365	0.366	0.271	0.232	-0.362	-0.425
1995	3444	2.788	3.000	0.375	0.385	0.282	0.252	-0.312	-0.323
1996	3746	2.767	3.000	0.381	0.401	0.290	0.268	-0.281	-0.254
1997	4051	2.792	3.000	0.386	0.407	0.297	0.272	-0.253	-0.218
1998	4715	2.913	3.000	0.387	0.407	0.296	0.272	-0.253	-0.222
1999	5015	3.594	3.000	0.426	0.452	0.309	0.288	-0.124	-0.042
2000	4756	3.747	3.000	0.433	0.459	0.316	0.284	-0.090	-0.020
2001	4694	3.749	3.000	0.440	0.465	0.323	0.291	-0.057	0.006
2002	4711	3.763	3.000	0.442	0.466	0.330	0.296	-0.037	0.016
2003	4774	3.841	3.000	0.453	0.481	0.353	0.317	0.037	0.114
2004	4912	3.931	3.000	0.461	0.492	0.366	0.338	0.086	0.174
2005	5000	3.938	3.000	0.460	0.490	0.372	0.337	0.095	0.156
2006	4984	4.033	3.000	0.463	0.494	0.364	0.334	0.088	0.190
2007	4957	4.088	3.000	0.472	0.500	0.390	0.368	0.163	0.291
2008	5024	4.214	4.000	0.486	0.518	0.408	0.392	0.238	0.369
2009	5114	4.206	3.000	0.473	0.499	0.410	0.384	0.206	0.329
2010	5084	4.297	3.000	0.475	0.503	0.414	0.382	0.221	0.314
2011	4940	4.377	4.000	0.485	0.507	0.419	0.393	0.255	0.363
2012	4703	4.426	4.000	0.487	0.507	0.409	0.378	0.242	0.393
2013	2298	4.286	4.000	0.488	0.500	0.409	0.387	0.245	0.386

NUM_GEO is the number of geographic segments reported on Compustat. *HHI* is a sales-based Herfindahl index calculated using the firm's geographic segment sales. *FSTS* is the ratio of foreign sales to the total sales. *ID* is the international diversification index as the principal component of *HHI* and *FSTS*.

Table 2
Descriptive statistics

Variable	N	Mean	Median	Std Dev	Q1	Q3
BHAR_MKT_60	98,548	0.009	-0.004	0.237	-0.111	0.105
BHAR_FF3_60	97,343	-0.004	-0.007	0.261	-0.123	0.106
BHAR_BL_60	98,197	0.000	0.000	0.342	-0.168	0.168
UE_AF_t	98,548	-0.001	0.000	0.047	0.000	0.002
NUM_GEO	98,548	3.681	3.000	2.243	2.000	4.000
HHI	98,548	0.439	0.463	0.214	0.269	0.608
FSTS	98,548	0.348	0.312	0.236	0.154	0.494
ID	98,548	-0.010	0.049	0.962	-0.797	0.701
MV	98,548	6425	962	23257	296	3460
PRICE	98,548	28.980	22.633	30.758	11.352	38.762
VOLUME	98,548	45091385	6321009	178921708	1296547	27907283
IH	98,548	0.624	0.656	0.238	0.463	0.809
BM	98,548	0.518	0.429	0.461	0.261	0.664
NUM_BUS	98,548	2.184	1.000	1.562	1.000	3.000

BHAR_MKT_60 is the buy-and-hold abnormal return (the benchmark return is the value-weighted market index) over sixty days starting from quarter t's earnings announcement. *BHAR_FF3_60* is the buy-and-hold abnormal return (the benchmark return calculated as per the Fama-French three factor model) over sixty days starting from quarter t's earnings announcement. *BHAR_BL_60* is the buy-and-hold abnormal return (the benchmark return calculated as per the Barber and Lyon 1997), cumulated over sixty days starting from quarter t's earnings announcement. *UE_AF* is the actual earnings per share from I/B/E/S minus median earnings forecasts in the 90-day period before the earnings announcement date, scaled by price per share at the end of the quarter. *NUM_GEO* is the number of geographic segments reported on Compustat segment file. *HHI* is a sales-based Herfindahl index using the firm's geographic segment sales. *FSTS* is the ratio of foreign sales of the total sales. *ID* is the international diversification index as the principal component of *HHI* and *FSTS*. *MV* is the market value of equity at the end of the quarter. *PRICE* is the average daily closing price of the firm in the announcement month. *VOLUME* is the average daily dollar trading volume of the firm during the earnings announcement month. *IH* is the institutional holdings for each-quarter. *BM is* book-to-market ratio, measured as the book value of equity scaled by market value at the end of the quarter. *NUM_BUS* is the number of business segments reported on the Compustat segment file.

Table 3
Correlations

	BHAR_MKT_60	*BHAR_FF3_60*	*BHAR_BL_60*	SUE_AF_{t}	SUE_AF_{t-1}	*NUM_GEO*	*HHI*	*FSTS*	*ID*	*MV*	*PRICE*	*VOLUME*	*IH*	*BM*	*NUM_BUS*
BHAR_MKT_60	1.000	**0.799**	**0.627**	**0.134**	**0.020**	**0.021**	**0.015**	-0.001	**0.008**	**0.024**	**0.028**	0.005	**0.041**	**0.032**	**0.021**
BHAR_FF3_60	**0.803**	1.000	**0.520**	**0.119**	**0.013**	*0.006*	*0.008*	-0.003	0.002	**0.028**	**0.031**	**0.010**	**0.021**	-0.001	*0.007*
BHAR_BL_60	**0.666**	**0.543**	1.000	**0.088**	**0.015**	0.003	0.001	-0.005	-0.003	0.005	*0.008*	-0.003	*0.006*	-0.002	*0.006*
SUE_AF_{t}	**0.119**	**0.106**	**0.084**	1.000	**0.243**	**0.009**	**0.013**	**0.016**	**0.015**	**0.036**	**0.058**	**0.042**	**0.047**	-0.005	**0.016**
SUE_AF_{t-1}	**0.017**	**0.015**	**0.015**	**0.242**	1.000	*0.008*	**0.011**	**0.014**	**0.013**	**0.053**	**0.101**	**0.066**	**0.050**	**-0.053**	**0.013**
NUM_GEO	**0.008**	0.002	0.001	*0.006*	*0.006*	1.000	**0.716**	**0.458**	**0.623**	**0.172**	**0.076**	**0.140**	**0.145**	**-0.017**	**0.000**
HHI	**0.010**	**0.008**	0.004	**0.013**	**0.011**	**0.600**	1.000	**0.792**	**0.938**	**0.194**	**0.086**	**0.170**	**0.156**	**-0.050**	**-0.086**
FSTS	0.002	0.002	-0.002	**0.015**	**0.014**	**0.356**	**0.683**	1.000	**0.949**	**0.098**	**0.011**	**0.096**	**0.099**	**-0.044**	**-0.047**
ID	*0.007*	*0.006*	0.001	**0.015**	**0.013**	**0.534**	**0.933**	**0.900**	1.000	**0.153**	**0.047**	**0.138**	**0.135**	**-0.046**	**-0.079**
MV	**-0.012**	0.003	-0.001	**-0.010**	*-0.006*	**0.124**	**0.131**	**0.077**	**0.116**	1.000	**0.737**	**0.889**	**0.393**	**-0.341**	**0.233**
PRICE	**-0.027**	0.000	0.001	**0.064**	**0.108**	**0.051**	**0.084**	**-0.019**	**0.041**	**0.271**	1.000	**0.672**	**0.373**	**-0.361**	**0.179**
VOLUME	**-0.031**	**-0.012**	0.001	**0.048**	**0.074**	**0.124**	**0.167**	**0.070**	**0.134**	**0.362**	**0.672**	1.000	**0.352**	**-0.349**	**0.151**
IH	0.004	*0.008*	*0.007*	**0.051**	**0.055**	**0.127**	**0.152**	**0.077**	**0.129**	**0.009**	**0.399**	**0.380**	1.000	**-0.019**	**0.108**
BM	**0.067**	**0.033**	0.001	**-0.023**	**-0.063**	-0.001	**-0.040**	**-0.014**	**-0.031**	**-0.118**	**-0.318**	**-0.279**	**-0.040**	1.000	**0.087**
NUM_BUS	0.003	0.002	0.003	**0.015**	**0.012**	**0.021**	**-0.065**	**-0.045**	**-0.061**	**0.148**	**0.198**	**0.184**	**0.118**	**0.039**	1.000

Pearson and Spearman Correlations are below (above) the diagonal. *BHAR_MKT_60* is the buy-and-hold abnormal return (the benchmark return is the value-weighted market index) over sixty days starting from quarter t's earnings announcement. *BHAR_FF3_60* is the buy-and-hold abnormal return (the benchmark return calculated as per the Fama French three-factor model) over sixty days starting from quarter t's earnings announcement. *BHAR_BL_60* is the buy-and-hold abnormal return (the benchmark return calculated as per Barber and Lyon 1997), cumulated over sixty days starting from quarter t's earnings announcement. *UE_AF* is the actual earnings per share from I/B/E/S minus median earnings forecasts in the 90-day period before the earnings announcement date, scaled by price per share at the end of the quarter. *NUM_GEO* is the number of geographic segments reported on Compustat segment file. *HHI* is a sales-based Herfindahl index using the firm's geographic segment sales. *FSTS* is the ratio of foreign sales of the total sales. *ID* is the international diversification index as the principal component of *HHI* and *FSTS*. *MV* is the market value of equity at the end of the quarter. *PRICE* is the average daily closing price of the firm in the announcement month. *VOLUME* is the average daily dollar trading volume of the firm during the earnings announcement month. *IH* is the institutional holdings for each-quarter. *BM is* book-to-market ratio, measured as the book value of equity scaled by market value at the end of the quarter. *NUM_BUS* is the number of business segments reported on Compustat segment file. Correlation coefficients that are in **bold** are significant at the 0.01 level. Correlation coefficients that are in *italic* are significant at the 0.05 or 0.10 level.

Table 4

The association between international diversification and serial correlation of standardized earnings surprises based on analyst earnings forecasts: for the full sample and for subsamples partitioned by the implementation of SFAS 131.

$$SUE\_AF_t = \beta_0 + \beta_1 SUE\_AF_{t-1} + \beta_2 DHHI_t + \beta_3 SUE\_AF_{t-1}*DHHI_t + \beta_7 DMV_t + \beta_8 SUE\_AF_{t-1}*DMV_t + \varepsilon_t \quad (5)$$

	Dependent variable = SUE_AF_t							
	(1) Full sample		(2) Pre-SFAS 131		(3) Post-SFAS 131		(4) Pre - Post	
Parameter	Estimate	t-stat	Estimate	t-stat	Estimate	t-stat	t-stat	z-stat
Intercept	-0.0059	-1.61	-0.0233	-3.38	0.0041	1.10	-3.82***	-3.45***
SUE_AF t-1	0.2054	20.68***	0.1989	12.02***	0.2091	16.75***	-0.49	-0.50
DHHI	-0.0011	-0.27	-0.0132	-1.76*	0.0059	1.34	-2.34**	-1.69*
SUE_AF t-1 *DHHI	**0.0113**	**0.87**	**0.0643**	**3.05*****	**-0.0194**	**-1.26**	**3.24*****	**3.25*****
DMV	0.0269	4.53***	0.0596	5.62***	0.0079	1.34	4.61***	3.89***
*SUE_AF t-1 *DMV*	0.0635	4.80***	0.0764	3.04***	0.0560	3.71***	0.74	0.81
*# of positive coeff. on SUE_AF t-1 *DHHI*	54/98		27/36		27/62			
N	98		36		62			
Adj. R-square	0.0672		0.0867		0.0559			

We estimate the model (5) by quarter and assess the significance of coefficients using the approach in Fama-MacBeth (1973). *SUE_AF* is the decile ranked analyst forecast errors (*UE_AF*). *DHHI* is the decile ranking of sales-based Herfindahl index using the firm's geographic segment sales (*HHI*). *DMV* is the decile ranking of the market value of equity (*MV*). *, **, *** indicate significance at the 0.10, 0.05, and 0.01 levels, respectively, for a two-tailed t-test. In column (4), the t-stat (z-stat) refers to the statistical significance for the difference in means (median) of the coefficients of the Pre-SFAS 131 and those of the Post-SFAS 131 periods.

Table 5

The association between international diversification and PEAD for standardized earnings surprises based on analyst earnings forecasts: for the full sample and for sample partitioned by the implementation of SFAS 131.

$$BHAR = \beta_0 + \beta_1*SUE\_AF_t + \beta_2*DHHI_t + \beta_3*SUE\_AF_t*DHHI_t + \beta_4*DMV_t + \beta_5*SUE\_AF_t*DMV_t + \beta_6*DVOL_t + \beta_7*SUE\_AF_t*DVOL_t + \beta_8*DPRC_t + \beta_9*SUE\_AF_t*DPRC_t + \beta_{10}*DIH_t + \beta_{11}*SUE\_AF_t*DIH_t + \beta_{12}*BM_t + \varepsilon_t \quad (4)$$

Panel A: Buy-and-hold abnormal return (*BHAR_MKT_60*) over sixty days starting from quarter t's earnings announcement, where the expected returns are based on the value-weighted market return.

	BHAR = BHAR_MKT_60							
	(1) Full sample		(2) Pre-SFAS 131		(3) Post-SFAS 131		(4) Pre - Post	
Parameter	Estimate	t-stat	Estimate	t-stat	Estimate	t-stat	t-stat	z-stat
Intercept	0.0027	0.34	-0.0182	-2.08**	0.0148	1.35	-2.08**	-1.96*
SUE_AF$_t$	0.1066	11.98***	0.0704	5.16***	0.1276	11.79***	-3.24***	-3.29***
DHHI	0.0073	2.00**	0.0087	1.50	0.0065	1.37	0.29	0.31
SUE_AF$_t$*DHHI	**0.0206**	**2.06****	**0.0492**	**3.13*****	**0.0040**	**0.32**	**2.23****	**2.37****
DMV	0.0189	1.11	0.0310	1.73*	0.0119	0.48	0.54	0.40
*SUE_AF$_t$*DMV*	-0.1350	-5.64***	-0.1622	-4.29***	-0.1192	-3.86***	-0.87	-1.49
DPRC	-0.0145	-1.58	-0.0195	-2.19**	-0.0116	-0.85	-0.42	-1.30
*SUE_AF$_t$*DPRC*	0.0357	2.62**	0.0755	3.14***	0.0126	0.80	2.27**	2.42**
DVOL	-0.0260	-1.64	-0.0149	-1.02	-0.0324	-1.37	0.53	1.54
*SUE_AF$_t$*DVOL*	0.0705	3.23***	0.1042	3.40***	0.0510	1.73*	1.18	2.04**
DIH	0.0042	0.80	-0.0032	-0.44	0.0085	1.20	-1.08	-0.46
*SUE_AF$_t$*DIH*	-0.0368	-3.64***	-0.0547	-3.01***	-0.0264	-2.22**	-1.35	-0.79
BM	0.0140	2.77***	0.0220	2.42**	0.0093	1.57	1.22	1.22
*# of positive coeff. on SUE_AF$_t$*DHHI*	55/98		24/36		31/62			
N	98		36		62			
Adj. R-square	0.0507		0.0382		0.0579			

The variables are defined in Table 2. *DHHI* is the decile ranking of sales-based Herfindahl index using the firm's geographic segment sales (*HHI*). *DMV*, *DVOL*, *DPRC*, and *DIH* are the decile rank ranging between zero and one for *MV, VOLUME, PRICE,* and *IH*, respectively. We estimate the model (6) by quarter and assess the significance of coefficients using the approach in Fama-MacBeth (1973). *, **, *** indicate significance at the 0.10, 0.05, and 0.01 levels, respectively for a two-tailed t-test. In column (4), the t-stat (z-stat) refers to the statistical significance for the difference in means (median) of the coefficients of the Pre-SFAS 131 and those of the Post-SFAS 131 periods.

Panel B: Buy-and-hold abnormal return (*BHAR_FF3_60*) over sixty days starting from quarter t's earnings announcement, where expected returns are based on the Fama and French three-factor model.

	BHAR = BHAR_FF3_60							
	(1) Full sample		(2) Pre-SFAS 131		(3) Post-SFAS 131		(4) Pre - Post	
Parameter	Estimate	t-stat	Estimate	t-stat	Estimate	t-stat	t-stat	z-stat
Intercept	-0.0132	-2.23**	-0.0282	-2.63**	-0.0045	-0.66	-1.97**	-1.97**
SUE_AF_t	0.1047	9.60***	0.0605	3.22***	0.1303	10.59***	-3.23***	-2.98***
DHHI	0.0051	1.28	0.0067	1.04	0.0041	0.82	0.32	0.48
SUE_AF_t*DHHI	**0.0277**	**2.23****	**0.0583**	**2.79*****	**0.0099**	**0.66**	**1.90***	**2.47****
DMV	0.0260	2.10**	0.0447	2.26**	0.0151	0.96	1.15	1.27
SUE_AF_t*DMV*	-0.1290	-4.55***	-0.1560	-2.93***	-0.1133	-3.48***	-0.73	-0.79
DPRC	0.0119	1.46	0.0203	1.59	0.0070	0.67	0.79	0.08
SUE_AF_t*DPRC*	0.0279	1.70*	0.0510	1.76*	0.0144	0.74	1.08	1.46
DVOL	-0.0365	-2.99***	-0.0519	-2.71**	-0.0275	-1.74*	-0.96	-1.22
SUE_AF_t*DVOL*	0.0538	2.05**	0.1019	2.03**	0.0258	0.89	1.41	1.03
DIH	-0.0064	-1.23	-0.0134	-1.52	-0.0023	-0.36	-1.03	-0.73
SUE_AF_t*DIH*	-0.0316	-2.30**	-0.0325	-1.17	-0.0311	-2.11**	-0.05	-0.27
BM	0.0126	2.30**	0.0241	2.00**	0.0060	1.19	1.60	1.37
# of positive coeff. on SUE_AF_t*DHHI*	60/98		26/36		34/62			
N	98		36		62			
Adj. R-square	0.0335		0.0236		0.0392			

The variables are defined in Table 2. *DHHI* is the decile ranking of sales-based Herfindahl index using the firm's geographic segment sales (*HHI*). *DMV*, *DVOL*, *DPRC*, and *DIH* are the decile rank ranging between zero and one for *MV, VOLUME, PRICE,* and *IH*, respectively. We estimate the model (6) by quarter and assess the significance of coefficients using the approach in Fama-MacBeth (1973). *, **, *** indicate significance at the 0.10, 0.05, and 0.01 levels, respectively for a two-tailed t-test. In column (4), the t-stat (z-stat) refers to the statistical significance for the difference in means (median) of the coefficients of the Pre-SFAS 131 and those of the Post-SFAS 131 periods.

Panel C: Buy-and-hold abnormal return (*BHAR_BL_60*) over sixty days starting from quarter t's earnings announcement, where the expected returns are based on the returns of control firms (Barber and Lyon 1997).

	BHAR = BHAR_BL_60							
	(1) Full sample		(2) Pre-SFAS 131		(3) Post-SFAS 131		(4) Pre - Post	
Parameter	Estimate	t-stat	Estimate	t-stat	Estimate	t-stat	t-stat	z-stat
Intercept	0.0003	0.04	0.0049	0.35	-0.0024	-0.43	0.56	0.11
SUE_AF_t	0.1079	8.68***	0.0719	3.07***	0.1287	9.46***	-2.25**	-2.12**
DHHI	0.0054	1.18	0.0074	1.01	0.0043	0.73	0.33	0.59
SUE_AF_t*DHHI	**0.0338**	**2.00****	**0.0820**	**2.43****	**0.0058**	**0.33**	**2.21****	**1.88***
DMV	0.0381	2.80***	0.0462	2.41**	0.0334	1.81*	0.45	0.06
SUE_AF_t*DMV*	-0.1232	-3.50***	-0.1275	-1.96*	-0.1207	-2.91***	-0.09	-0.92
DPRC	-0.0188	-1.99**	-0.0337	-2.69**	-0.0101	-0.78	-1.21	-2.51**
SUE_AF_t*DPRC*	0.0435	1.96*	0.0900	2.31**	0.0164	0.62	1.61	1.85
DVOL	-0.0319	-2.15**	-0.0344	-1.65	-0.0305	(1.50)	-0.13	0.55
SUE_AF_t*DVOL*	0.0680	2.18**	0.0628	1.12	0.0710	1.89*	-0.13	0.15
DIH	0.0099	1.86*	0.0160	1.89*	0.0063	0.93	0.88	1.48
SUE_AF_t*DIH*	-0.0576	-3.59***	-0.0709	-2.55**	-0.0500	-2.54**	-0.63	-0.79
BM	-0.0077	-1.55	-0.0182	-1.62	-0.0016	-0.38	-1.62	-1.18
# of positive coeff. on SUE_AF_t*DHHI*	54/98		23/36		31/62			
N	98		36		62			
Adj. R-square	0.0164		0.0146		0.0174			

The variables are defined in Table 2. *DHHI* is the decile ranking of sales-based Herfindahl index using the firm's geographic segment sales (*HHI*). *DMV*, *DVOL*, *DPRC*, and *DIH* are the decile rank ranging between zero and one for *MV, VOLUME, PRICE,* and *IH*, respectively. We estimate model (6) by quarter and assess the significance of coefficients using the approach in Fama-MacBeth (1973). *, **, *** indicate significance at the 0.10, 0.05, and 0.01 levels, respectively for a two-tailed t-test. In column (4), the t-stat (z-stat) refers to the statistical significance for the difference in means (median) of the coefficients of the Pre-SFAS 131 and those of the Post-SFAS 131 periods.

Table 6
The results of portfolio tests

Panel A. *BHAR* based on the market portfolio over 60 days starting from quarter t's earnings announcement (*BHAR_MKT_60*).

HHI Quintile	UE_AF Quintile											
	Pre-SFAS131						Post-SFAS131					
	1 (Low)	2	3	4	5 (High)	Difference (5-1)	1 (Low)	2	3	4	5 (High)	Difference (5-1)
1	-0.0156	-0.0258	-0.0200	0.0041	0.0334	0.0490	-0.0174	-0.0118	-0.0020	0.0277	0.0624	0.0799
2	-0.0108	-0.0315	-0.0155	0.0043	0.0385	0.0493	-0.0150	-0.0167	-0.0033	0.0315	0.0710	0.0859
3	-0.0232	-0.0361	-0.0136	0.0078	0.0475	0.0707	-0.0134	-0.0134	-0.0020	0.0272	0.0663	0.0797
4	-0.0239	-0.0316	-0.0068	0.0018	0.0426	0.0666	-0.0144	-0.0092	-0.0032	0.0285	0.0715	0.0858
5	-0.0228	-0.0173	-0.0138	0.0035	0.0593	0.0821	-0.0056	-0.0131	-0.0057	0.0195	0.0791	0.0847
Difference						**0.0331**						**0.0048**

Panel B: *BHAR* based on the Fama-French three-factor model over 60 days starting from quarter t's earnings announcement (*BHAR_FF3_60*).

HHI Quintile	UE_AF Quintile											
	Pre-SFAS131						Post-SFAS131					
	1 (Low)	2	3	4	5 (High)	Difference (5-1)	1 (Low)	2	3	4	5 (High)	Difference (5-1)
1	-0.0228	-0.0310	-0.0236	-0.0090	0.0124	0.0352	-0.0355	-0.0234	-0.0107	0.0079	0.0472	0.0827
2	-0.0222	-0.0247	-0.0209	-0.0138	0.0348	0.0570	-0.0327	-0.0278	-0.0104	0.0143	0.0487	0.0814
3	-0.0303	-0.0450	-0.0274	-0.0068	0.0387	0.0690	-0.0337	-0.0215	-0.0114	0.0121	0.0447	0.0783
4	-0.0492	-0.0377	-0.0202	0.0007	0.0306	0.0798	-0.0352	-0.0168	-0.0105	0.0121	0.0503	0.0855
5	-0.0316	-0.0211	-0.0154	-0.0023	0.0427	0.0743	-0.0313	-0.0250	-0.0100	0.0074	0.0558	0.0871
Difference						**0.0391**						**0.0044**

Panel C: *BHAR* based on the Barber-Lyon measure over 60 days starting from quarter t's earnings announcement (*BHAR_BL_60*).

HHI Quintile	UE_AF Quintile											
	Pre-SFAS131						Post-SFAS131					
	1 (Low)	2	3	4	5 (High)	Difference (5-1)	1 (Low)	2	3	4	5 (High)	Difference (5-1)
1	-0.0124	-0.0246	-0.0260	0.0082	0.0343	0.0467	-0.0402	-0.0159	-0.0045	0.0100	0.0411	0.0813
2	0.0024	-0.0266	-0.0065	0.0080	0.0552	0.0528	-0.0333	-0.0261	-0.0139	0.0195	0.0507	0.0841
3	-0.0364	-0.0247	-0.0078	0.0080	0.0427	0.0791	-0.0364	-0.0284	-0.0047	0.0059	0.0507	0.0871
4	-0.0267	-0.0197	-0.0048	0.0077	0.0495	0.0761	-0.0330	-0.0300	-0.0063	0.0219	0.0514	0.0844
5	-0.0389	-0.0148	-0.0036	0.0119	0.0706	0.1095	-0.0247	-0.0190	-0.0082	0.0090	0.0580	0.0827
Difference						**0.0628**						**0.0014**

This table reports the average *BHAR* for the portfolios based on the international diversification quintiles and earnings surprise quintiles. Firm-quarter observations are independently sorted into five international diversification groups and five *SUE* groups, and the returns in each group are reported. Specifically, we rank all firm-quarter observations into five *HHI* quintiles from lowest *HHI* to highest *HHI*. We also independently classify all firm-quarter observations into five *UE_AF* quintiles from lowest *UE_AF* to highest *UE_AF*: 5 being the highest and 1 being the lowest.

Table 7
Results based on constant sample

Panel A. The association between international diversification and serial correlation of standardized earnings surprises based on analyst earnings forecasts: for the full sample and for subsamples partitioned by the implementation of SFAS 131.

	Dependent variable = SUE_AF_t							
	(1) Full sample		(2) Pre-SFAS 131		(3) Post-SFAS 131		(4) Pre - Post	
Parameter	Estimate	t-stat	Estimate	t-stat	Estimate	t-stat	t-stat	z-stat
Intercept	0.0008	0.22	-0.0073	-1.19	0.0055	1.31	-1.44	-1.20
SUE_AF t-1	0.2080	15.20***	0.2140	12.24***	0.2045	10.72***	0.34	0.10
DHHI	-0.0029	-0.62	-0.0126	-1.69*	0.0028	0.50	-1.76*	-1.59
SUE_AF t-1 *DHHI	**-0.0046**	**-0.25**	**0.0460**	**2.27****	**-0.0340**	**-1.55**	**2.64****	**2.38****
DMV	0.0216	3.43***	0.0416	5.07***	0.0099	1.44	2.31**	2.12**
*SUE_AF t-1 *DMV*	0.0728	3.12***	0.0740	1.76*	0.0721	2.60**	0.05	0.21
*# of positive coeff. on SUE_AF t-1 *DHHI*	54/98		24/36		30/62			
N	98		36		62			
Adj. R-square	0.0674		0.0892		0.0557			

We estimate the model (5) by quarter and assess the significance of coefficients using the approach in Fama-MacBeth (1973). *SUE_AF* is the decile ranked analyst forecast errors (*UE_AF*). *DHHI* is the decile ranking of sales-based Herfindahl index using the firm's geographic segment sales (*HHI*). *DMV* is the decile ranking of the market value of equity (*MV*). *, **, *** indicate significance at the 0.10, 0.05, and 0.01 levels, respectively, for a two-tailed t-test. In column (4), the t-stat (z-stat) refers to the statistical significance for the difference in mean (median) of the coefficients of the Pre-SFAS 131 and those of the Post-SFAS 131 periods.

Table 7 (Cont.)
Results based on constant sample

Panel B. The association between international diversification and PEAD for standardized earnings surprises based on analyst earnings forecasts: for the full sample and for sample partitioned by the implementation of SFAS 131.

	BHAR = BHAR_MKT_60						BHAR = BHAR_FF3_60						BHAR = BHAR_BL_60					
	(1) Pre-SFAS 131		(2) Post-SFAS 131		(3) Pre - Post		(4) Pre-SFAS 131		(5) Post-SFAS 131		(6) Pre - Post		(7) Pre-SFAS 131		(8) Post-SFAS 131		(9) Pre - Post	
Parameter	Estimate	t-stat	Estimate	t-stat	t-stat	z-stat	Estimate	t-stat	Estimate	t-stat	t-stat	z-stat	Estimate	t-stat	Estimate	t-stat	t-stat	z-stat
Intercept	-0.0058	-0.56	0.0327	2.66**	-2.53**	-2.71**	-0.0110	-1.00	0.0175	2.63**	-2.34**	-2.33**	0.0021	0.17	0.0027	0.37	-0.04	-0.17
SUE_AF_t	0.0860	7.01***	0.1357	9.03***	-1.93*	-2.31**	0.0656	2.86***	0.1315	8.82***	-2.22**	-2.06**	0.1009	3.76***	0.1639	5.32***	-1.59	-1.78*
DHHI	0.0115	1.48	0.0051	0.82	0.84	0.84	0.0099	1.42	0.0011	0.18	1.06	1.16	0.0085	0.84	0.0049	0.58	0.33	0.84
SUE_AF_t*DHHI	**0.0474**	**2.85*** **	**-0.0059**	**-0.37**	**1.97***	**2.21*** *	**0.0584**	**2.90*** **	**-0.0035**	**-0.18**	**2.00*** *	**2.19*** *	**0.0838**	**2.48*** *	**-0.0075**	**-0.32**	**2.14*** *	**2.07*** *
DMV	0.0171	0.98	-0.0135	-0.41	0.80	0.18	0.0302	1.66*	-0.0024	-0.11	1.07	1.23	0.0424	1.98**	0.0165	0.61	0.71	0.41
SUE_AF_t*DMV	-0.1756	-4.64***	-0.1166	-2.43**	-0.89	-1.28	-0.1685	-3.28***	-0.1182	-1.93*	-0.66	-1.00	-0.1297	-2.63**	-0.0541	-1.03	-0.84	-1.11
DPRC	-0.0242	-2.68**	-0.0220	-1.61	-0.13	-0.67	0.0091	0.63	-0.0045	-0.42	0.90	0.16	-0.0402	-2.33**	-0.0189	-1.51	-1.19	-1.76*
SUE_AF_t*DPRC	0.0660	3.13***	0.0008	0.04	1.77*	1.44	0.0438	1.64	0.0072	0.35	0.87	0.97	0.0753	2.25**	-0.0211	-0.96	1.99**	2.02**
DVOL	-0.0060	-0.45	-0.0045	-0.13	-0.04	1.02	-0.0421	-3.12***	-0.0083	-0.39	-1.18	-1.32	-0.0261	-1.12	-0.0005	-0.02	-0.65	(0.01)
SUE_AF_t*DVOL	0.1090	2.70**	0.0468	0.96	0.97	1.36	0.1163	2.47**	0.0372	0.62	1.04	1.46	0.0451	1.39	0.0023	0.04	0.49	(0.55)
DIH	-0.0101	-1.29	-0.0041	-0.59	-0.53	0.03	-0.0164	-2.95***	-0.0159	-2.37**	-0.04	-0.21	0.0170	1.79*	-0.0080	-1.05	1.96*	1.99**
SUE_AF_t*DIH	-0.0563	-3.19***	-0.0277	-1.58	-1.00	-0.66	-0.0326	-1.35	-0.0270	-1.56	-0.18	0.35	-0.0889	-2.66**	-0.0617	-2.39**	-0.60	-0.66
BM	0.0206	1.92*	0.0073	1.19	1.17	1.06	0.0161	1.50	-0.0019	-0.33	1.36	1.09	-0.0160	-1.13	0.0004	0.06	-1.51	-0.92
# of positive coeff. on SUE_AF_t*DHHI	24/36		30/62				21/36		30/62				25/36		28/62			
N	36		62				36		62				36		62			
Adj. R-square	0.0440		0.0624				0.0283		0.0439				0.0141		0.0187			

We estimate the model (6) by quarter and assess the significance of coefficients using the approach in Fama-MacBeth (1973). The variables are defined in Table 2. *DHHI* is the decile ranking of sales-based Herfindahl index using the firm's geographic segment sales (*HHI*). *DMV*, *DVOL*, *DPRC*, and *DIH* are the decile rank ranging between zero and one for *MV, VOLUME, PRICE,* and *IH*, respectively. *, **, *** indicate significance at the 0.10, 0.05, and 0.01 levels, respectively, for a two-tailed t-test. In columns (3), (6), and (9), the t-stat (z-stat) refers to the statistical significance for the difference in means (median) of the coefficients of the Pre-SFAS 131 and those of the Post-SFAS periods.

Table 8
Results of forecast bias test

	BIAS_AF						BIAS_RW					
	(1) Pre-SFAS 131		(2) Post-SFAS 131		(3) Pre - Post		(4) Pre-SFAS 131		(5) Post-SFAS 131		(6) Pre - Post	
	Estimate	t-stat	Estimate	t-stat	t-stat	z-stat	Estimate	t-stat	Estimate	t-stat	t-stat	z-stat
Intercept	0.0003	0.60	-0.0007	-2.58**	1.95*	1.66*	0.0004	0.09	-0.0041	-0.77	0.58	-0.36
HHI	**0.0014**	**3.70*****	**0.0001**	**0.41**	**3.89*****	**3.36*****	**0.0015**	**1.28**	**0.0016**	**1.87***	**-0.07**	**0.16**
SIZE	-0.0002	-3.40***	0.0000	-0.94	-2.29**	-1.97*	-0.0002	-0.69	0.0000	-0.24	-0.38	0.26
NUM_BUS	0.0001	1.69*	0.0000	-0.16	2.05**	1.84*	-0.0001	-0.36	0.0000	0.38	-0.53	-0.82
STDROA	-0.0107	-5.75***	-0.0052	-6.22***	-3.03***	-2.99***	-0.0549	-6.27***	-0.0344	-5.87***	-2.00**	-1.53
LOSS	0.0022	5.69***	0.0016	9.60***	1.63	1.96*	0.0159	11.12***	0.0172	8.40***	-0.43	0.04
NANA	0.0000	-1.21	0.0000	-1.85*	-0.77	-0.69	0.0001	1.70*	0.0002	4.01***	-0.41	-0.58
DISP	0.2604	4.66***	0.0653	1.81*	3.06***	2.98***	1.0431	5.44***	0.6845	2.68**	0.97	1.17
# of positive coeff. on HHI	27/36		35/64				22/36		36/64			
N	36		62				36		62			
Adj. R-square	0.0254		0.0276				0.1095		0.1327			

We estimate the forecast bias regression by quarter and assess the significance of coefficients using the approach in Fama-MacBeth (1973). *BIAS_AF* is the median forecast in the 90-day period before the earnings announcement date minus actual earnings per share from I/B/E/S, scaled by price per share at the end of the quarter. *BIAS_RW* is the *negative* of earnings per share before extraordinary items minus earnings per share in the same quarter of the prior year, scaled by the price per share at the end of the quarter. *SIZE* is the natural logarithm of market value of equity. *NUM_BUS* is the number of business segments reported on Compustat segment file. *STDROA* is the historical standard deviation of return on assets (*ROA*) over the preceding five years. *LOSS* is an indicator variable that takes the value of 1 if the company had negative *ROA*, 0 otherwise. *NANA* is the natural logarithm of number of analysts providing an annual earnings forecast. *DISP* is the standard deviation of analysts' earnings forecasts scaled by the stock price at the end of the prior fiscal quarter *, **, *** indicate significance at the 0.10, 0.05, and 0.01 levels, respectively, for a two-tailed t-test. In columns (3) and (6), the t-stat (z-stat) refers to the statistical significance for the difference in means (median) of the coefficients of the Pre-SFAS 131 and those of the Post-SFAS periods.