The Shortcomings of Segment Reporting and their Impact on Analysts' Earnings Forecasts

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Abstract:

Despite the incomplete and discretionary nature of segment reporting under ASC 280 (SFAS 131) and IFRS 8, existing research suggests that disaggregation across business segments improves the ability of security analysts to forecast earnings. However, we find that greater disaggregation across reportable business segments is not associated with higher analysts' forecasts accuracy. On the contrary, information aggregated in few business segments is associated with a smaller earnings forecast error. We attribute this finding to the following three shortcomings of segment reporting: (1) its discretionary nature when defining the reporting segments, (2) the absence of relevant line items to report, and (3) the blurred perspective on operations. Accordingly, we document and quantify a discrepancy between firm profitability as obtained from firm-level data and firm-level profitability as aggregated from segment-level data and show that this discrepancy is associated with a higher forecast error. Our findings suggest that segment reporting does not accurately assist in the assessment of the firms' overall performance. Our panel consists of a sample of 910 diversified US listed companies and covers the period 2009 to 2016.

1. Introduction

The necessity of understanding individual business activities and the importance of disaggregated information availability when analyzing diversified companies is long acknowledged and considered to be indispensable, particularly for financial analysis (e.g. Jenkins Report 1964, AIMR 1993, AICPA 1994, Epstein & Palepu, 1999). To help users of financial statements in their understanding of the firm's risk, return and growth, segment reporting should split the individual business activities according to their risk, return, and growth characteristics (Herrmann & Thomas, 2000b). Inherently, the usefulness of segment reporting depends on the segment split and the provided line items per segments.

Segment reporting under ASC280 (SFAS 131) and IFRS 8, respectively requires public companies to disclose balance sheet and income statement items across different types of business activities aggregated in reported segments. This aggregation follows the management approach, aimed at enabling external users of segment reporting to view segments in the same way as the management.

Empirical research finds that segment reporting as introduced by SFAS 131 in 1997 (and later adopted by the IASB in IFRS 8 in 2006) increased the number of actual reported segments and added transparency, particularly with regard to segment profitability (Ettredge, Kwon, Smith, & Stone, 2006a). Nevertheless, studies also document a reduction of line item disclosure following the implementation of IFRS 8 (André, Filip, & Moldovan, 2016; Bugeja, Czernkowski, & Moran, 2015), discretion with regard to the actual concentration of business activities in reported segments, aimed at managing segment performance (Berger & Hann, 2007), as well as management of segment performance through intersegment income shifting (Lail, Thomas, & Winterbotham, 2014), transferring profits from segments operating in industries with lower valuation multiples to those with higher multiples (You, 2014). In light of these findings, it is even questionable whether SFAS 131 has really achieved its desired impact of improving segment reporting, since segment disclosure practices have remained virtually unchanged over this ten year period (Bell, 2015). Moreover, literature finds that the incremental explanatory power of segment information is generally low, which might be explained by considerable measurement errors in reported segments (P. F. Chen & Zhang, 2003; Givoly, Hayn, & D'Souza, 1999).

Given the current shortcomings of segment reporting, we analyze the effect that different levels of business activity aggregation have on analysts forecast accuracy. We find that disaggregation of business activities in an increased number of segments does not improve the accuracy of earnings forecasts. In particular, we show that information aggregation of business activities in segments is associated with higher forecast accuracy.

Furthermore, we analyze whether the forecast error is explained by a systematic discrepancy in aggregated segment performance. In a bottom up approach, aiming to reconcile firm level profitability by aggregating individual segment level profitability, we provide evidence of a quantifiable discrepancy, which in turn ties to a higher forecast error. We document a positive relationship between the identified discrepancy and the forecast error.

We contribute to existing segment reporting literature by showing that segment reporting does not accurately break down firm profitability and concomitantly to extant forecasting literature by

showing the existence of a link between analysts` earnings forecast error and the profitability mismatch between segment aggregated firm profitability and firm profitability as obtained from firm level data

The paper is organized as follows: Section 2 encompasses a literature review and develops our hypothesis and lays out our research design. Section 3 covers our results, which are finally discussed in Section 4.

2. Literature

Effective disclosure of diversified companies reduces information asymmetries (Bens & Monahan, 2004; T. K. Chen & Liao, 2015; Diamond & Verrecchia, 1991; Ettredge et al., 2006a). Disclosure of business segments leads to an increased permeability of stock returns to earnings forecasts (Ettredge, Kwon, Smith, & Zarowin, 2005) and contributes to market efficiency and value-relevance in general (Hossain, 2008; Park, 2011).

Existing literature emphasizes the acceptance and use of the DuPont model by market participants in forecasting earnings and future profitability (Fairfield & Yohn, 2001; Soliman, 2008). Empirical evidence suggests that profitability, growth and their drivers are captured in stock returns (Akbas, Jiang, & Koch, 2017; Cooper, Gray, & Johnson, 2011; Nissim & Penman, 2001). This strongly advocates for the usefulness of taking segment-level profitability analysis as a starting point to forecast aggregated future earnings of the firm. A key prerequisite, however, is a disaggregation and a relevant line item reporting on segment level that effectively reveals operating profitability of individual business activities.

Intrinsically, different business activities exhibit specific risk, return and growth opportunities. Through a proper segment split, analysts can better identify idiosyncratic growth rates that ultimately yield a more transparent valuation framework. Detailed financial statement data (fundamental signals) flow into the decision making process of market participants (Abarbanell & Bushee, 1997). Inherently, extant security analysis literature emphasizes the importance of a clear separation between the operating and financing activities of the firm (Nissim & Penman, 2001; Penman, 2016).

By synthesizing the literature streams above, effective segment reporting implies disclosure of the core lines of business, the core drivers of profitability, the idiosyncratic growth as suggested by the DuPont scheme, as well as a separation of firm operating activities from firm financing activities.

Nevertheless, empirical literature finds a stark contrast between effective segment reporting as outlined above and the current state of segment reporting: (1) the relevance of segment split is not granted, internal cost are not disclosed (in contrast to its counterpart: internal revenue) and potentially hide true performance (Berger & Hann, 2007; Lail, Thomas, & Winterbotham, 2015). (2) There is no clear split between operating and financial items within the segment income statement and balance sheet items. Critical items such as leases, financial assets, or operating liabilities against customers and suppliers (advance payments, or accounts payable) are not readily identifiable, or are not required to be reported separately at all. Therefore (3) the data required for the reporting of business segments is blurred and only of limited use for the identification and

prediction of key profitability indicators. It is e.g., not clear which assets constitute the segment assets (cash and equivalents, goodwill), if assets are missing (e.g. operating leases) and therewith blurring the interpretability of asset turnover. On the other hand, in the case of the profit margin, a dissagregation of the internal costs, as a potential driver of the margin, is also missing.

3. Research Design

We investigate the effects of segment reporting on analysts' earnings forecast using the following base equation (Baldwin, 1984; Behn, Choi, & Kang, 2008; Dhaliwal, Radhakrishnan, Tsang, & Yang, 2012; O. K. Hope, 2003):

$$F\_ERROR_{i,t} = \beta_0 + \beta_1 DIFFABSERROR_{i,t} + \beta_2 HHIBUS_{i,t} + \beta_3 ACCRUALS_{i,t} + \beta_4 NESTIMATES_{i,t} + \beta_5 EPS\_STDEV_{i,t} + \beta_6 SIZE_{i,t} + \varepsilon_{i,t} \quad (1)$$

The dependent variable is the forecast error at time t calculated as:

$$F\_ERROR_{i,t} = \frac{\left|EPS_{i,t} - EPS\ Forecast_{i,t}\right|}{Price_{i,t}}$$

Our main explanatory variable is the difference (unexplained mismatch/error) in profitability resulting from calculating the firm`s return on equity by aggregating segment profitability, denoted as $aggROE$ versus ROE calculated based on reported firm level figures:

$$DIFFABSERROR_{i,t} = \left|aggROE_{i,t} - ROE_{i,t}\right|$$

We reconstruct firm level return on equity from segment level return on equity as follows:

$$aggROE_{i,t} = aggROA_{i,t} + \frac{Total\ Debt}{Total\ Equity} \times (aggROA_{i,t} - Net\ Borrowing\ Costs_{i,t})$$

Where,

$$aggROA_{i,t} = \sum_{j}^{n} \omega_{i,j,t} \times \frac{Segment\ Operating\ Icome_{i,j,t}}{Segment\ Total\ Assets_{i,j,t}}$$

with n representing the number of segments of firm i at time t.

We use as a proxy for net borrowing costs the difference between operating income and net income scaled by total debt:

$$Net\ Borrowing\ Costs_{i,t} = \frac{Operating\ Income_{i,t} - Net\ Income_{i,t}}{Total\ Debt_{i,t}}$$

Return on equity on firm level is calculated by:

$$ROE_{i,t} = \frac{Net\ Income_{i,t}}{Total\ Equity_{i,t}}$$

Through our second explanatory variable, we investigate the effect of segment information concentration on analysts`forecast error by computing the Herfindahl-Hirschman Index with respect to business segment revenue. We construct the index as the sum of the squared ratios of individual segment revenue to total firm revenue:

$$HHIBUS_{i,t} = \sum_{j}^{n} \left(\frac{Segment\ Revenue_{i,j,t}}{Total\ Revenue_{i,t}} \right)^2$$

where n denotes the number of business segments of firm i at time t.

All our models include firm parameters such as the ratio of accruals, number of analysts` estimates that contribute to the earnings forecast, the standard deviation of the past 5 years` earnings per share, while also controlling industry, year, diversification fixed effects and firm random effects. As a robustness check, we rerun our regressions controlling for firm fixed effects and find similar results.

4. Data

Our initial dataset contains 4,411 US listed firms covering the 8-year period from 2009 to 2016. We select 2009 as the starting year for our analysis, as it excludes the financial crisis, yet covers the period of internationally harmonized segment reporting (ASC 280 was adopted in substance by IFRS 8).

Due to the nature of our research question, we restrict our analysis to diversified firms, reporting two or more business segments. We drop firms which trade at a price below $1, for which no earnings forecast is available, those for which we cannot calculate the past 5 year`s earnings standard deviation, or for which no segment level data exists (Akbas et al., 2017). This results in our working sample of 991 diversified firms or 4,110 firm-year observations.

Insert Tables 1 & 2 here

For a complete description of our variables and data sources please refer to Table 3 below.

Insert Table 3 here

5. Results

Model 1, covers the regression listed in Equation 1, including both our main explanatory variables and finds concomitantly (1) a significant positive relationship between the earnings forecast error and our difference in firm profitability metric, (2) as well as a significant negative relationship between the earnings forecast error and segment revenue concentration.

Insert Tables 4 & 5 here

First, the positive coefficient for DIFFABSERROR implies that a higher mismatch between the firm's segment aggregated profitability and overall firm profitability is associated with a higher earnings forecast error.

We attribute this finding to the shortcomings of current segment reporting. Discretionary in nature (Berger & Hann, 2007; Lail et al., 2014)and prone to measurement errors (Givoly et al., 1999), segment reporting fails to offer a proper breakdown of firm profitability and inherently fails in its attempt to aid analysts in their exercise of forecasting firm earnings.

Second, the negative coefficient for HHIBUS signals that higher segment revenue concentration is associated with a decrease in analysts` forecast error.

Intrinsically, this advocates against an exhaustive breakdown of revenue streams into reporting segments, in contrast to position papers (e.g. Jenkins Report 1964, AIMR 1993, AICPA 1994, Epstein & Palepu, 1999) and existing literature that strongly advocates for an increased breakdown of company activities (Akbas et al., 2017; Fairfield & Yohn, 2001; Nissim & Penman, 2001; Penman, 2016; Soliman, 2008), as well as an increase in the number of line items in current segment reporting (Herrmann & Thomas, 2000a).

However, we interpret this result as evidence for the fact that the status quo of segment reporting fails to disclose vital information that is relevant for analysts in their forecasting of future earnings. Surpassed in terms of disclosure amount and scope by end of year reporting, which offers a relatively good basis for assessing profitability, growth and risk, segment reporting fails to deliver the vital value added needed by analysts when forecasting future earnings. In this respect, we see that for firms whose overall end of year reported numbers, disclosed in the more detailed firm level reporting and therefore closely resembling those of the concentrated segment, forecast errors are lower.

We then run Models 2 and 3, leaving out HHIBUS and DIFFABSERROR respectively, and find that the effects reported above are persistent and significant to the 0.05 and 0.10 confidence levels.

Building on the hypothesis that forecast errors are smaller for companies containing highly concentrated business segments, we interact our business concentration index with our profitability mismatch variable and label this as Equation 2:

$$F\_ERROR_{i,t} = \beta_0 + \beta_1 DIFFABSERROR_{i,t} + \beta_2 HHIBUS_{i,t} + \beta_3 HHIBUS_{i,t} \times DIFFABSERROR_{i,t} + \beta_4 ACCRUALS_{i,t} + \beta_5 NESTIMATES_{i,t} + \beta_6 EPS\_STDEV_{i,t} + \beta_7 SIZE_{i,t} + \varepsilon_{i,t} \quad (2)$$

Model 4 covers the regression listed in Equation 2 and finds that β_3 is indeed negative and significant, evidencing the moderating role that HHIBUS has on the relationship between the forecast error and our profitability mismatch variable. Ceteris paribus, an increase in HHIBUS would result in a reduction of the slope characterizing the fitted linear relationship between analysts` forecast error and the mismatch between segment level aggregated and firm level profitability.

We interpret this result as evidence for the fact that the status quo of segment reporting fails to disclose vital information that is relevant for analysts in their forecasting of future earnings.

6. Conclusion

Previous research finds that current segment reporting fails to provide an adequate split according to a diversified firm`s individual business profitability, risk and growth dimensions. Discretionary disaggregation coupled with limited disclosure of key line items (such as a breakdown between operating and financial assets) do not facilitate an accurate understanding i.e. a breakdown of current profitability into its core drivers which serve as a basis for forecasting future profitability

We add to this literature by investigating the effect that segment reporting has on analysts` earnings forecasts and hypothesize that in its current state, segment reporting does not effectively assist analysts in forecasting future earnings.

Consistently, we document the existence of a profitability mismatch between segment-aggregated profitability vs. firm level profitability and show that this mismatch is positively associated with analysts` earnings forecast error. Furthermore, we find that firms with higher segment revenue concentration are associated with a lower forecast error. Finally, we show that segment revenue concentration moderates the relationship between the forecast error and the previously defined mismatch in profitability with a higher revenue concentration in few business segments decreasing the aforementioned positive linear association

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Table 1

Descriptive Statistics

Variable	Mean	SD	Min	Max	n
ACCRUALS	0.043	0.029	0	0.360	4,110
DIFFABSERROR	0.061	0.417	0	22.4	4,110
EPS_STDEV	27.9	1,078.7	0.010	51,665.7	4,110
F_ERROR	0.077	0.196	0	2.135	4,110
HHIBUS	0.520	0.210	0.084	1	4,110
NAICSCOM	3.862	1.949	1	17	4,110
NESTIMATES	10.651	7.858	1	45	4,110
NSEGBUS	4.194	1.626	2	21	4,110
NSEGGEO	3.953	3.467	1	49	3,630
NSEGCOM	7.791	4.070	2	54	4,110
REVT[1]	7,297.3	19,078.0	0.863	210,943.0	4,110
SECTORSCOM	2.089	1.101	1	10	4,110
TOTAL ASSETS[1]	9,904.6	40,833.5	2.557	781,818.0	4,110

[1] in million USD

Table 2

Correlation Coefficients

	ACCRUALS	DIFFABSERROR	EPS_STDEV	F_ERROR	HHIBUS	NESTIMATES	SIZE
ACCRUALS		**0.057**	**0.050**	**0.209**	**0.101**	**-0.071**	**-0.172**
DIFFABSERROR	**0.139**		**0.045**	**0.336**	0.006	**-0.034**	-0.012
EPS_STDEV	**0.057**	**0.124**		**0.166**	**-0.103**	0.000	**0.131**
F_ERROR	**0.213**	**0.220**	**0.201**		0.008	**-0.157**	**-0.163**
HHIBUS	**0.092**	**0.050**	**-0.134**	**0.038**		**-0.163**	**-0.234**
NESTIMATES	**-0.135**	-0.029	**0.043**	**-0.230**	**-0.176**		**0.661**
SIZE	**-0.202**	0.022	**0.159**	**-0.202**	**-0.260**	**0.699**	

Spearman (Pearson) correlations are below (above) the diagonal.
Bold entries denote significance at $p < 0.05$.

TABLE 3
Variable Descriptions and Construction

Variable Name		Description and Construction
ACCRUALS		Ratio between depreciation and amortization as reported in the cash flow statement (Compustat Fundamental Database) scaled by the firm`s total assets (Compustat Fundamental Database). The metric is calculated with respect to year T, (Dechow, Sloan, & Sweeney, 1995; Francis, LaFond, Olsson, & Schipper, 2005; Hribar & Collins, 2002)
DIFFABSERROR		The absolute difference between the return on common equity (ROCE) as derived from the company`s business segments (Compustat Segment Database) and return on common equity as derived from company`s financial statements (Compustat Fundamental Database) multiplied by the absolute bookvalue per share scaled by the market share price at the end of fiscal year T (Compustat Funadamental Database). The metric is calculated with respect to year T.
EPS_STDEV		Natural logarithm of the standard deviation of the firm`s earnings per share before extraordinary items (Compustat Fundamental Database) in the most recent 5 fiscal years, from year T-5 to T (Dichev & Tang, 2009)
F_ERROR		The absolute difference between the earnings per share before extraordinary items as reported by the firm (Compustat Fundamental Database) and the forecasted earnings per share before extraordinary items at t from T-1 (Thomson Reuters I/B/E/S Database) scaled by the market share price at the end of fiscal year T (Baldwin, 1984; Behn et al., 2008; Dhaliwal et al., 2012; O. K. Hope, 2003)
HHIBUS		Business segment revenue concentration index computed using the Herfindahl-Hirschman approach, calculated as the sum of the squared revenue shares of the company`s individual business segments. (Cho, 2015; O.-K. Hope, Kang, Thomas, & Vasvari, 2009; O. K. Hope, Kang, Thomas, & Vasvari, 2008; Lang & Stulz, 1994)
NAICSCOM		Number of NAICS (North American Industry Classification System) codes that the company reports in year T
NESTIMATES		Natural logarithm of the number of analysts` estimates that flow into the earnings per share before extraordinary items forecast in year T
NSEGGEO		Number of geographical segments reported by the firm in year T (Compustat Segment Database)
NSEGBUS		Number of business segments reported by the firm in year T (Compustat Segment Database)
NSEGCOM		Total number of segments reported by the firm in year T (Compustat Segment Database)
SIZE		Natural logarithm of the total revenue as reported by the firm in year T(Compustat Fundamental Database)
SECTORSCOM		Total number of different business sectors in which the firm is active in year T, as obtained from the first two digits of the reported firm-wide NAICS codes (Compustat Segment Database)
SIC		The first two digits of the Standard Industrial Classification (SIC) Code, denoting the major industry group in which the firm is primarily active, which appear in the firms`s disseminated filings in year T.

Table 4

Regression Analysis

		Forecast Error (Random Effects)											
		Model 1			Model 2			Model 3			Model 4		
Independent Variable	Exp. Sign	Coeff.	Robust Std. Err.	t	Coeff.	Robust Std. Err.	t	Coeff.	Robust Std. Err.	t	Coeff.	Robust Std. Err.	t
Segment Variables													
HHIBUS	-	-0.055 **	0.025	-2.19				-0.061 **	0.026	-2.33	0.022	0.026	0.87
DIFFABSERROR	+	0.074 **	0.031	2.35	0.074 **	0.032	2.35				0.961 ***	0.202	4.76
HHIBUS x DIFFABSERROR	-										-1.152 ***	0.25	-4.57
Firm Parameters													
ACCRUALS	+	2.221 ***	0.380	5.85	2.207 ***	0.380	5.80	2.333 ***	0.402	5.81	2.036 ***	0.367	5.55
NESTIMATES	-	-0.021 **	0.009	-2.32	-0.021 **	0.009	-2.36	-0.026 ***	0.010	-2.66	-0.019 **	0.009	-2.17
EPS_STDEV	+	0.009 **	0.004	2.13	0.009 **	0.004	2.18	0.008 **	0.004	1.95	0.009 **	0.004	2.33
SIZE	-	-0.018 ***	0.006	-3.07	-0.016 ***	0.006	-2.77	-0.017 ***	0.006	-2.75	-0.019 **	0.006	-3.09
Controls													
R-squared		0.10			0.10			0.08			0.16		
Observations		4,110			4,110			4,110			4,110		
No. Of Groups		910			910			910			910		

*, **, *** Denote significance at p < 0.10, < 0.05, and < 0.01, respectively.
We control for industry, year and diversification fixed effects.

Table 5

		Forecast Error (Fixed Effects)											
		Model 1			Model 2			Model 3			Model 4		
Independent Variable	Exp. Sign	Coeff.	Robust Std. Err.	t	Coeff.	Robust Std. Err.	t	Coeff.	Robust Std. Err.	t	Coeff.	Robust Std. Err.	t
Segment Variables													
HHIBUS	-	-0.050 **	0.037	-1.34				-0.062 *	0.038	-1.64	0.032	0.041	0.79
DIFFABSERROR	+	0.062 **	0.022	2.88	0.063 ***	0.022	2.89				1.158 ***	0.344	3.36
HHIBUS x DIFFABSERROR											-1.411 ***	0.43	-3.25
Firm Parameters													
ACCRUALS	+	3.617 *	0.707	5.11	3.612 ***	0.707	5.11	3.647 ***	0.718	5.08	3.366 ***	0.670	5.02
NESTIMATES	-	-0.031 **	0.016	-1.96	-0.031 **	0.016	-1.98	-0.037 **	0.017	-2.21	-0.037 **	0.015	-2.47
EPS_STDEV	+	-0.019 ***	0.006	-2.96	-0.019 ***	0.006	-2.97	-0.018 ***	0.007	-2.77	-0.014 ***	0.006	-2.49
SIZE	-	-0.037 **	0.019	-1.96	-0.034 **	0.018	-1.86	-0.036 **	0.019	-1.91	-0.032 *	0.018	-1.79
Controls													
R-squared		0.12			0.12			0.10			0.18		
Observations		4,110			4,110			4,110			4,110		
No. Of Groups		910			910			910			910		

*, **, *** Denote significance at p < 0.10, < 0.05, and < 0.01, respectively.

We control for industry, year and diversification, firm fixed effects.