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Earnings Forecasts and Firm Characteristics in the Wholesale and Retail Industries

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Abstract

Purpose: This study investigates the relationship between earnings forecasts estimated from a cross-sectional earnings forecast model and firm characteristics such as firm size, sales volatility, and earnings volatility. **Research design, data and methodology:** The association between earnings forecasts and the aforementioned firm characteristics is examined using 214 firm-year observations with analyst following and 848 firm-year observations without analyst following for the period of 2011-2019. I estimate future earnings using a cross-sectional earnings forecast model, and then compare these model-based earnings forecasts with analysts' earnings forecasts in terms of forecast bias and forecast accuracy. The earnings forecast bias and accuracy are regressed on firm size, sales volatility, and earnings volatility. **Results:** For a sample with analyst following, I find that the model-based earnings forecasts are more accurate as the firm size is larger, whereas the analysts' earnings forecasts are less biased and more accurate as the firm size is larger. However, for a sample without analyst following, I find that the model-based earnings forecasts are more pessimistic and less accurate as firms' past earnings are more volatile. **Conclusions:** Although model-based earnings forecasts are useful for evaluating firms without analyst following, their accuracy depends on the firms' earnings volatility.

Keywords : Analyst Forecasts, Cross-Sectional Earnings Model, Model-Based Earnings Forecasts, Forecast Bias, Forecast Accuracy

JEL Classification Code: G17, L81, M41

1. Introduction

Forecasting a firm's future performance is critical for valuation, investment decision, and capital budgeting. Prior literature emphasizes the stock market's expectation of future earnings as a proxy for a firm's performance since the 1990s, and valuation models based on future earnings forecasts have been thus developed (Ohlson, 1995). Most research relies on analysts' earnings forecasts to utilize valuation models because financial analysts are known to be sophisticated and have a rich set of information that includes private as well as public information (Fried & Givoly, 1982; O'Brien, 1988).

However, analysts' earnings forecasts tend to be optimistically biased due to conflicts of interest and are only available for a subset of firms that are typically large and stable. Recent research introduces cross-sectional earnings forecast models to forecast future earnings, as an alternative to analysts' earnings forecasts. Moreover, these studies have validated the earnings forecasts generated by the cross-sectional models by comparing them with the analysts' earnings forecasts (Hou et al., 2012; Li & Mohanram, 2014; Evans et al., 2017).

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Given a dynamic business environment combined with technological innovation and advancement in the wholesale and retail industries, firms in those industries, except for a few leading firms, are likely to be small and unstable. The transition from an off-line to an on-line business model has resulted in the ongoing crisis of traditional firms. This model-based approach to earnings forecasts may be useful for small and unstable firms which are not followed by analysts but required to estimate future earnings forecasts. Meanwhile, model-based earnings forecasts are derived from past and current accounting information and may not be appropriate for the firms facing ever-changing challenges in the wholesale and retail industries. In such a case, rather than questioning the validity of model-based forecasts in those industries, this study would seek to shed light on the conditions under which model-based forecasts could be more accurate relating to firm characteristics.

To investigate the conditions under which model-based forecasts could be more accurate, I choose three firm characteristics, namely, firm size, sales volatility, and earnings volatility. This study evaluates the model-based earnings forecasts in terms of forecast bias and forecast accuracy. While forecast bias captures the level of optimistic (or pessimistic) earnings forecasts, forecast accuracy does the accuracy of earnings forecasts. As forecast bias is defined in previous literature as the difference between *ex-post* actual earnings and *ex-ante* forecasted earnings, scaled by price, the negative (positive) forecast bias is indicative of optimistic (pessimistic) earnings forecast. As forecast accuracy is defined as the absolute value of forecast bias, the bigger value indicates less accurate earnings forecast.

Using 214 firm-year observations with analyst following from 2011 to 2019, I find that the model-based earnings forecast accuracy is negatively related to the firm size, suggesting that the model-based earnings forecasts are more accurate as the firm size is larger. Meanwhile, both analysts' earnings forecast bias and forecast accuracy are strongly related to the firm size, implying that the analysts' earnings forecasts are less biased and more accurate as the firm size is larger as predicted in prior literature.

Next, when I compare the different group of firms, those with analyst following are larger in size and have less volatile earnings than those without analyst following. Those two samples exhibit distinct characteristics. Using 848 firm-year observations without analyst following, I find that the model-based earnings forecasts are more pessimistic and less accurate as the firms' earnings become more volatile. They are not related to the firm size. Although model-based earnings forecasts are demanded for a sample of firms without analyst following, they are less accurate when past earnings are more volatile. In sum, model-based earnings forecast bias and accuracy are strongly related to the earnings volatlilty for a sample without analyst following, which is not found for a sample with analyst following.

Previous research generally compares the performance of model-based earnings forecasts to a benchmark, such as analysts' earnings forecasts. To accomplish this, the sample is generally restricted to a subset of firms with analyst following. This study pays attention to differences in firm characteristics between firms with and without analyst following and tries to clarify the conditions under which model-based forecasts are more accurate in relation to the firm characteristics. To the best of my knowledge, this is the first study to focus on such a difference.

This paper proceeds as follows: Section 2 consists of a review of prior literature and the development of a hypothesis; Section 3 outlines the research design, which includes the earnings forecast model and sample selection; Section 4 presents empirical findings; and Section 5 concludes with a summary of the study's findings and implications.

2. Literature Review and Research Hypothesis

Although analysts' earnings forecasts have been widely used in accounting and finance research, they have significant limitations for researchers for two reasons. First, the analysts' earnings forecasts are optimistically biased due to a variety of conflicts of interest (O'Brien, 1988; Francis & Philbrick, 1993; Dugar & Nathan, 1993; Lin & McNichols, 1998; Easton & Sommers, 2007; Bradshaw et al., 2012; Lee & So, 2017). Second, analysts' earnings forecasts are available for a subset of large and mature firms, thereby limiting the coverage of firms and resulting in underrepresentation of small and emerging firms (Hou et al., 2012; Li & Mohanram, 2014). Although Larocque (2013) and Mohanram and Gode (2013) argue that forecast errors are predicted and removed from analysts' earnings forecasts, they fail to recognize the limited sample problem caused by the analyst coverage of firms.

Hou et al. (2012) and Li and Mohanram (2014) recently addressed these limitations of analysts' earnings forecasts by introducing a cross-sectional earnings forecast model that allows the prediction of future earnings for a large sample of firms. Their model-based earnings forecasts not only increase the sample size but are also free of the optimistic biases caused by conflicts of interest because they are based on historical accounting data.

Harris and Wang (2019) suggest that the accuracy of both model-based and analyst-based earnings forecasts is industry-specific. Whether model-based earnings forecasts are suitable for firms in the wholesale and retail industries which are changing rapidly now and in the future, remains unclear. However, as long as there are few alternatives to analysts' earnings forecasts or model-based earnings forecasts, I should focus on the firm characteristics with which model-based forecasts could be more accurate.

Prior research has identified several firm characteristics influencing earnings forecasts. Firm size is well known to be a determinant of analysts' earnings forecast accuracy, with larger firms having more accurate forecasts (Easton & Sommers, 2007; Larocque, 2013; Lee & So, 2017). Fama and French (2006) include the firm size in their expected earnings model because it is related to profitability.

According to Keung (2010), sales information influences the accuracy of analysts' earnings forecasts via supplementary sales forecasts. Francis et al. (2005) focus on the innate characteristics driven by the firms' business model, which are linked to accruals quality. Among innate characteristics, sales volatility may influence forecast bias and forecast accuracy via accruals quality or directly in dynamic industries.

Some studies state that firms with smoother (less volatile) earnings are perceived to be less risky because their future earnings are easier to predict (Francis et al., 2004; Myers et al., 2007; McInnis, 2010). Smoothness is one of the accounting-based earnings attributes and is defined as the volatility of earnings relative to the volatility of cash flows, also known as earnings volatility.

The following hypothesis is tested in a null form to elucidate the relationship between forecast bias (forecast accuracy) and firm characteristics, such as firm size, sales volatility, and earnings volatility:

[H] There is no relationship between model-based earnings forecast bias (forecast accuracy) and firm characteristics, such as firm size, sales volatility, and earnings smoothness.

3. Research Design

3.1. A Cross-Sectional Earnings Forecast Model

This study employs a cross-sectional earnings forecast model based on current earnings, book values, and total accruals to forecast future earnings, which is called a RI model recommended by Li and Mohanram (2014). This model is contrasted with Hou et al.'s (2012) earnings forecast model incorporatig dividends information into the model. Leaving aside the irrelevance of dividends, Li and Mohanram (2014) argue that their earnings forecast model outperforms that of Hou et al. (2012) in terms of forecast bias and accuracy.

As motivated by the residual income valuation model of Feltham and Ohlson (1996), the cross-sectional earnings forecast model is called the RI model and specified as a function of the residual income factors (earnings and book values) and income statement effect of conservatism (accruals) as follows:

$$\begin{aligned} EPS_{i,t+1} = \ & \beta_0 + \beta_1 \times Neg_{i,t} + \beta_2 \times EPS_{i,t} \\ & + \beta_3 \times Neg * EPS_{i,t} + \beta_4 \times BPS_{i,t} \\ & + \beta_5 \times TACC_{i,t} \\ & + \epsilon_{i,t} \qquad (1) \end{aligned}$$

where $EPS_{i,t+1}$ ($EPS_{i,t}$) denotes *ex-post* realized earnings per share of firm *i* in year *t+1* (year *t*); $Neg_{i,t}$ is a dummy variable that equals 1 for loss firms and 0 otherwise; $Neg * EPS_{i,t}$ is an interaction term of the dummy variable with earnings to reflect different persistence of profit and loss; $BPS_{i,t}$ is book value of equity per share; and $TACC_{i,t}$ is total accruals per share instead of capital expenditures suggested by Feltham and Ohlson (1996). The total accruals are defined as the sum of the changes in working capital, net non-current operating assets, and net financial assets (Richardson et al., 2005). All explanatory variables are measured at the end of year *t*.

The above pooled cross-sectional regression is estimated using data from the past ten years for each year. Then, to predict future earnings in year *t+1*, I multiply the independent variables as of year *t* by the coefficients from the above regression model.

3.2. Firm Characteristics Which May Affect Forecast Bias and Forecast Accuracy

Forecasts bias describes the extent to which earnings forecasts are skewed above or below *ex-post* realized earnings. It is defined as the price-scaled difference between *ex-post* actual earnings and *ex-ante* forecasted earnings. A negative forecast bias value indicates optimism in earnings forecasts, whereas a positive value indicates pessimism. Meanwhile, forecast accuracy is defined as the absolute value of forecast bias and refers to the precision of earnings forecasts. This study investigates the conditions that could lead to more accurate model-based forecasts by focusing on the relationship between forecast bias and accuracy and a few firm characteristics.

While forecast bias is important in the context of analyst earnings forecasts because of their optimistic earnings forecasts, forecast accuracy is also crucial because it measures how much the *ex-ante* earnings forecasts differ from the *ex-post* realized earnings. A higher forecast accuracy value indicates less accurate earnings forecasts. Prior research indicates that smaller firms and firms with more volatile earnings have less accurate analysts' earnings forecasts (Brown et al., 1987; Easton & Sommers, 2007; Keung, 2010; Larocque, 2013; Lee & So, 2017). However, there is little empirical evidence on the relationship between model-based earnings forecasts and firm characteristics.

The cross-sectional earnings forecast models forecast future earnings by incorporating earnings-related accounting data such as current earnings, a dummy variable representing negative earnings, book values of equity, and total accruals. These earnings-related variables are excluded from the firm characteristics of interest in this study, because they are deeply related to model-based earnings forecasts and the resulting model-based forecast bias and accuracy. I instead focus on firm size, sales volatility, and earnings volatility.

Following Fama and French's (2006) study, I measure firm size as the log of total market capitalization. Sales volatility is the standard deviation of sales revenues scaled by average total assets over the past five years (Francis et al., 2005). Earnings volatility or smoothness (Smooth) is defined as the standard deviation of net income scaled by average total assets divided by the standard deviation of operating cash flows scaled by average total assets over the past five years (Francis et al., 2004; McInnis, 2010). Higher smoothness values indicate greater earnings volatility.

3.3. Sample Selection

The sample consists of Korean firms, listed on the Korea Stock Exchange or the Korea Securities Dealers Automated Quotations, with December fiscal year-end in the wholesale and retail industries. I obtain analysts' earnings forecast data and financial statement data from DataGuide. The analysts' earnings forecast is the median consensus value of earnings forecasts released from April to June of year *t+1* to ensure that it reflects the financial statement information of year *t*. All continuous variables are winsorized at their 1st and 99th percentiles to mitigate the influence of outliers. The final sample includes 214 firm-year observations with analyst following and 848 firm-year observations without analyst following.

4. Results and Discussion

4.1. Coefficient Estimates from the Cross-Sectional Earnings Forecast Model

Table 1 shows the average coefficients from the RI model-based regressions estimated annually from 2011 to 2019 using data from the previous ten years and their times-series Newey-West t-statistics to correct for serial dependence. The results of the 1-year-ahead earnings regressions are shown in the table. All coefficients but that of $TACC_{i,t}$ have signs consistent with the results of Li and Mohanram (2014). The coefficient on lagged earnings is 0.698 (*t-stat* = 45.70), as predicted, indicating that earnings are highly persistent. The average adjusted R^2 is 0.675.

Table 1: Coefficient Estimates from the Earnings Forecasting Model

	Intercept	NEG	EPS	NEG* EPS	BPS	TACC	Adj.R^2
Coefficient	-0.043	-0.452	0.698	-1.044	0.011	0.041	0.675
t-stat	(-8.00)	(-11.37)	(45.70)	(-39.40)	(12.67)	(12.59)	

4.2. Descriptive Statistics and Correlation Analysis

Table 2 provides descriptive statistics for various firm characteristics, forecast bias, and forecast accuracy. Sales volatility (*Sales_Vol*), earnings volatility (*Smooth*), and firm size (*Size*) have mean values of 0.180, 0.870, and 13.629, respectively. *Bias_An* (*Bias_Mo*) is referred to as analysts' earnings forecast bias (model-based earnings forecast bias) with mean value of −0.042 (−0.001). As expected, analysts' earnings forecast bias is negative, indicating an optimistic forecast. *Accuracy_An* (*Accuracy_Mo*) is referred to as analysts' earnings forecast accuracy (model-based earnings forecast accuracy), and its mean value is 0.056 (0.060).

Table 2: Descriptive Statistics

Variable	Mean	Std.Dev.	P1	Median	P99
Sales_Vol	0.180	0.158	0.006	0.132	0.700
Smooth	0.870	0.810	0.046	0.662	3.794
Size	13.629	1.334	10.763	13.812	16.209
Bias_An	-0.042	0.094	-0.394	-0.020	0.151
Bias_Mo	-0.001	0.110	-0.370	0.006	0.286
Accuracy_An	0.056	0.087	0.000	0.027	0.394
Accuracy_Mo	0.060	0.093	0.000	0.027	0.389

Table 3 reports Pearson correlations between forecast bias (forecast accuracy) and firm characteristics, which represent univariate relationships. In terms of analyst earnings forecast, the correlation between forecast bias (forecast accuracy) and firm size is 0.161 (−0.212), which is statistically significant, indicating that as firm size increases, the earnings forecast becomes less optimistically biased (more accurate). In terms of model-based earnings forecast, the correlation between model-based forecast accuracy and firm size is −0.253, indicating that as the firm size increases, earnings forecast becomes more accurate. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 3: Pearson Correlations

	Bias_An	Bias_Mo	Accuracy_An	Accuracy_Mo
Sales_Vol	-0.012	0.064	0.057	0.088
Smooth	0.113	0.126	-0.014	0.003
Size	0.161**	-0.039	-0.212***	-0.253***

4.3. Regression Analyses Using a Sample with Analyst Following

Table 4 provides the results of the hypothesis developed in Section 2 regarding the relationship between forecast bias (forecast accuracy) and firm characteristics, i.e., firm size, sales volatility, and earnings volatility, in multivariate regressions.

These multivariate findings support the univariate findings that analysts' earnings forecast bias is positively related to the firm size, and analysts' earnings forecast accuracy is negatively related to the firm size, suggesting that the analysts' earnings forecasts are less biased and more accurate as the firm size is larger. Model-based earnings forecast accuracy is negatively related to the firm size.

Table 4: Multivariate Regressions for a Sample with Analyst Following

	Bias_An	Bias_Mo	Accuracy_An	Accuracy_Mo
Intercept	-0.187**	0.063	0.237***	0.352***
	(-2.58)	(0.73)	(3.56)	(5.08)
Sales_Vol	0.013	0.046	0.015	0.032
	(0.31)	(0.95)	(0.40)	(0.81)
Smooth	0.012	0.019	-0.001	0.002
	(1.55)	(1.66)	(-0.13)	(0.24)
Size	0.011**	-0.004	-0.013***	-0.018***
	(2.14)	(-0.76)	(-2.90)	(-3.86)
Year Effect	YES			
Adj.R^2	0.026	0.005	0.012	0.040
N	214			

4.4. Regression Analyses Using a Sample without Analyst Following

The aforementioned sample with analyst following limits the analyses to a subset of analyst-covered firms and impedes research into the relationship between model-based earnings forecast bias (forecast accuracy) and firm characteristics in case of firms without analyst following. I need to re-examine the relationship between model-based earnings forecast bias (forecast accuracy) and firm characteristics using a sample without analyst following because model-based earnings forecasts are useful to the firms without analyst following.

Table 5 compares the mean values of variables in a sample with analyst following to those without analyst following. The sample with analyst following consists of 214 firm-year observations, whereas the sample without analyst following consists of 848 firm-year observations, indicating that the number of firms not covered by analysts outnumbers those covered by analysts. Firms with analyst following are larger in size and less volatile in earnings than those without analyst following, as expected. In terms of variables used in the earnings forecasts model, the loss firm ratio in the sample without analyst following is 0.479, which is significantly higher than that in the sample with analyst following, that is 0.140. Firms with analyst following have higher earnings, book values, and total accruals than firms without analyst following. The fundamental difference between the two samples suggests the necessity of re-examining the relationship between model-based earnings forecast bias (forecast accuracy) and firm characteristics using a sample without analyst following.

Table 5: Sub-Sample Comparison of Mean Value of Variables by Analyst Following

Variable	Analyst Following (N=214)	No Analyst Following (N=848)	Differences	*t-stat*
Bias_An	-0.042			
Bias_Mo	-0.001	0.040	-0.041*	(-1.87)
Accuracy_An	0.056			
Accuracy_Mo	0.060	0.200	-0.140***	(-6.88)
Sales_Vol	0.180	0.212	-0.032**	(-2.51)
Smooth	0.870	1.488	-0.617***	(-7.09)
Size	13.629	11.190	2.438***	(25.11)
NEG	0.140	0.479	-0.339***	(-11.54)
EPS	4.355	0.453	3.902***	(7.32)
BPS	75.909	12.050	63.859***	(8.73)
TACC	3.078	0.344	2.734***	(2.74)

Table 6 shows the results of the same multivariate regressions for a different sample without analyst following. Accordingly, the results show some variation. First, the positive relationship (0.027) between model-based earnings forecast bias and earnings volatility (Smooth) is statistically significant. In case of analysts' earnings forecasts, I could interpret the positive relationship as less optimistically biased one. However, based on the earnings forecast model, I expect the forecast bias, the difference between actually realized earnings and model-based earnings forecasts, to be positive (pessimistic) or negative (optimistic). Hence, the positive relationship between model-based earnings forecast bias and earnings volatility can be expressed as the model-based earnings forecasts are more pessimistically biased as past earnings are more volatile, rather than less optimistically biased. Second, there is no relationship between model-based earnings forecast accuracy and firm size. Finally, for the sample without analysts following, the statistically significant positive relationship (0.052) exists between model-based earnings forecast accuracy and earnings volatility (Smooth). In a nutshell, model-based earnings forecasts are more pessimistic and less accurate as firms' earnings are more volatile for a sample without analyst following.

Table 6: Multivariate Regressions for a Sample without Analyst Following

	Bias_ Mo	Accuracy_Mo
Intercept	0.436	0.060
	(1.62)	(0.24)
Sales_Vol	-0.014	0.164*
	(-0.14)	(1.68)
Smooth	0.027**	0.052***
	(2.59)	(5.25)
Size	-0.034	0.001
	(-1.49)	(0.06)
Year Effect	YES	
Adj.R^2	0.008	0.032
N	848	

5. Conclusions

This study aims to investigate the relationship between earnings forecasts estimated from a cross-sectional model and firm characteristics such as firm size, sales volatility, and earnings volatility. I find that the model-based earnings forecast bias and accuracy are closely related to firms' earnings volatility for a sample without analyst following, although they are not related to earnings volatility but partly related to firm size for a sample with analysts following. These findings imply that while model-based earnings forecasts are useful for evaluating firms without analyst following, their accuracy depends on the firm characteristics such as earnings volatility in the wholesale and retail industries which are well-known as their dynamic nature.

It is possible that other firm characteristics impact the model-based earnings forecast bias and accuracy for a sample without analyst following, because the firm characteristics such as firm size, sales volatility, and earnings volatility are here selected in an ad-hoc manner. I leave the investigation of other possible firm characteristics to future research.

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