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Analyst Profession, Accounting Earnings and Stock Returns: Swedish Evidence

ABSTRACT

Recent research by Liu and Thomas (2000) and Dechow et al. (1999) suggest that analysts' forecasts are important in explaining contemporaneous prices/returns and they strengthen the estimated return-earnings relation. This study investigates the role of the analysts' earnings forecasts in explaining returns in Sweden where the analyst profession has considerably developed during the last two decades. This development raises the question of how well the Swedish analysts' forecasts perform if compared to reported accounting earnings in explaining returns. Analysts' forecasts and changes in them are found to be important in explaining returns. This forward looking information outperforms

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current earnings and earnings changes in explaining returns. Even so, a combination of accounting data and forecasts performs best in terms of explanatory power. As a robustness check of the results, random coefficient models and industry effects are investigated.

Key words: *Stock market, Valuation, Earnings response coefficients, Analysts' earnings forecasts*

JEL Classification: *M41, G15*

1. INTRODUCTION

Intentional earnings management implemented by the management of the firm, back-ward looking accounting conventions, tax legislation and other similar reasons are commonly said to create biasness in reported accounting earnings of the firm. The biasness in reported earnings is in turns suggested to be one reason for the low informational content of accounting earnings with respect to stock prices and returns (see e.g. Lev 1989). Mainly because of these problems in the reported earnings, researchers have begun to use analysts' earnings forecasts when investigating the return/price-earnings relation. This approach is motivated by the fact that the independent analysts should disclose earnings forecasts that are free of the influence of the management of the firm. Analysts monitor all the actions of the management of the firm including the ability of the management to successfully implement the strategy of the firm. Therefore, analysts' earnings forecasts are even said to reflect non-numerical information that cannot be involved in any financial statement numbers.

The use of analysts' earnings forecasts is especially motivated in Sweden, where the analyst profession has strongly developed during the past two decades as a result of the development of the stock market. The analyst profession has developed and the number of analysts has increased, because the equity investors need the information produced by the analysts. In 1985, there were only 128 certified financial analysts in Sweden, but in 2000 the corresponding figure was as high as 1 775. This development raises the question of how successful the Swedish analysts' have been in producing the relevant information to investors compared to e.g. the U.S. analysts. On the other hand, the Swedish accounting legislation has developed during the past two decades to better meet the information requirements set by the stock market. This raises another question of what is the relative importance of the analysts' earnings and reported accounting earnings in valuation.

Liu and Thomas (2000) use Ohlson's (1995) residual income model to express unexpected returns as a function of unexpected current earnings and revisions in earnings forecasts. The revised forecasts are assumed to capture the market's revised expectations of future earnings, i.e. assumed to capture other value relevant information besides current earnings change.

Dechow et al. (1999) regress stock prices on book values, current earnings, and analysts' consensus forecasts of next period earnings. Unlike Liu and Thomas (2000) they use an extension of the residual income model by Ohlson (1995) as a theoretical background for their study. They find that the explanatory power of this enhanced model is higher than that of the model containing only book values and earnings as explanatory variables. This indicates that the analysts' earnings forecasts do have value relevance in the price-earnings relation. Moreover, they find that current earnings are not statistically significantly related to stock prices in the enhanced model indicating that analysts' forecasts of next period earnings subsume the value relevant information involved in current earnings.

The primary purpose of this study is to compare the role of the Swedish analysts' earnings forecasts to that of the reported accounting earnings in the estimated returns-earnings relation, that is, the earnings response coefficients (ERC, hereafter). The returns-earnings models investigated include the traditional earnings levels and changes and models including analysts' earnings forecasts based on the extended residual income model by Ohlson (1995). The returns-earnings relation is estimated by controlling for the limited information content of accounting losses as reported by Hayn (1995) and Martikainen (1997).

The paper extends the current literature in two main respects. First, the previous results on the returns-earnings relation including those based on the use of the analysts' forecast are mainly based on US data, and the evidence based on non-US data is limited.[1] The paper uses data from the Swedish stock market in which the role and importance of the analyst profession has considerably increased during the sample period. This being the case, it can be assumed that the role of the analysts' forecasts has increased during the sample period. The Swedish stock market is also the leading Nordic stock market and the seventh largest stock market in Europe in 2000, which calls more published evidence on the functioning of the market.

Second, the paper directly compares the strength of the returns-earnings relation by using alternative returns-earnings model specifications based on accounting earnings and analysts' earnings forecasts. Several studies compare the ERCs estimated by using the traditional earnings levels and/or changes approach (see, among others, Collins and Kothari 1989, Kothari and Zimmerman 1995 and Brown et al. 2001). There is also a growing body of literature that applies Ohlson's (1995) residual income approach and analysts' earnings forecasts to do the same (see, for instance, Liu and Thomas 2000 and Dechow et al. 1999). The current paper extends these two research areas by estimating the ERCs based on both approaches. Further-

1 Exceptions include, for instance, Harris et al. (1994) who, use German data, and Dumontier and Labelle (1998), who use French data to investigate the value relevance of earnings. Prior Swedish evidence on return-earnings relation can be found in Runsten (1998) and Marton (1998). However, none of theses studies incorporates analyst consensus forecasts in the analysis.

more, the ERCs based on models containing both accounting earnings and analysts' earnings forecasts are directly compared. In this respect, the paper contributes to the literature by investigating the adequacy of different types of earnings information as a summary of value relevant events.

The remainder of the paper is organized as follows. The next section discusses alternative approaches to modeling the return-earnings relation. The data and statistical methods used in the study are reviewed in the third section. The fourth section provides the empirical results of the paper, and the conclusions are drawn in the fifth section.

2. MODELLING RETURNS-EARNINGS RELATION

2.1 Gordon's dividend discount model as a theoretical background

Gordon's dividend discount model is a frequently used theoretical underpinning in studies empirically modeling the returns-earnings relation. According to Gordon's model, stock returns are a function of unexpected earnings (see, for instance, Collins and Kothari 1989), because dividends can be expressed as a proportion of earnings. Following this reasoning, the returns-earnings relation is commonly investigated by regressing (abnormal) stock returns on the measure of the unexpected earnings as follows:

(1) $$CAR_{it} = \alpha + \beta UX_{it} + e_{it},$$

where CAR_{it} equals cumulated abnormal returns for period t, UX_{it} denotes the unexpected earnings of the ith firm for period t, α is an intercept term, β is the estimated slope coefficient, i.e. the ERC, and e_{it} is an error term with zero mean and constant variance. Studies estimating the price-earnings regressions are mainly interested in the significance of the estimated ERC and the explanatory power of the model. The estimated ERC should be statistically significantly different from zero if accounting earnings are related to stock returns. In accordance with the pioneering study by Ball and Brown (1968), unexpected earnings, i.e earnings changes, are often interpreted as a signal of new information upon which the market may react. Hence, these types of studies investigating the ERCs are conducted from an information perspective. Lo and Lys (2000) called this approach toward estimating the ERCs the *valuation relevance approach*.

There are three assumptions in the valuation relevance approach toward estimating the ERCs (Collins and Kothari 1989). First, there is a link between security prices and future dividends as decribed in Gordon's dividend discount model. Second, there is a relation between future dividends and future earnings. Third, future earnings are related to current earnings.

These assumptions are often critizised for being arbitrary and without theoretical rigor (see for instance, Bernard 1995 and Lo and Lys 1999). Partly due to this criticisim, alternative models are suggested as a background to model the returns-earnings relation as described in the next subsection.

2.2 Accounting-based model as a theoretical background

Ohlson's (1995) accounting-based valuation model constitutes the theoretical background for studies investigating the returns-earnings relation from the *value relevance perspective*. As compared to the valuation relevance approach based on Gordon's dividend discount model, this approach expresses stock prices directly in terms of accounting figures and provides a framework to link analyst forecasts to valuation. The latter characteristic of the model is especially important for this study. In contrast to the valuation relevance approach, the value relevance approach does not require explicit specifications for unexpected earnings and abnormal returns. However, both approaches require a valuation model to link accounting earnings to value changes.

Ohlson (1995) shows that the value of the firm can be expressed as a linear function of book value (b_t), earnings (x_t) and other information (v_t)[2]:

$$(2) \qquad P_t = (1-k)b_t + k\left(\frac{1+r}{r}x_t - d_t\right) + \omega v_t$$

where:

$k = \frac{\omega r}{1+r-\omega}$, d_t is net dividend payments at time t, r is the risk free rate of return and ω is a first order auto regressive parameter taking values between zero and one. Compared to previous valuation models this model incorporates both earnings and book value as relevant valuation attributes.

There is a growing body of literature that uses Equation (2) as a basis for the investigation of the value relevance of accounting information (see, for instance, Barth, Beaver and Landsman, 2001 and Hothausen and Watts, 2000 for a review). As pointed out by Easton and Sommer (2000) and Lo and Lys (2000), most of these studies are levels (price) studies, i.e. stock prices are regressed on accounting numbers. This study uses different returns specifications of Equation (2) to investigate the adequacy of accounting earnings and analysts' forecasts as a summary of the value relevant information that have affected the stock price over the return

2 The model is based on the following assumptions: (a) value equals discounted present value of future dividends, (b) clean surplus accounting (c) residual income (x_t^a and other information (v_t) follows an AR(1) process. Residual income is defined as: $x_t^a = x_t - r^* b_{t-1}$.

period. Various versions of Equation (2) are derived to investigate the contemporaneous association between stock returns and levels of earnings, changes of earnings, levels of forecasted earnings and changes in analysts' earnings forecasts.

Alternative versions of Ohlson's model can be derived by changing the assumption of the model parameters. First, if $\omega = 0$ *and* $\nu = 0$, Equation (2) reduces to:

(3) $$P_t = b_t$$

Equation (3) is the book value model of equity valuation indicating that all assets and liabilities of the firm are valued at market values and there are no economic rents that should increase the value of the firm. By taking first differences, invoking the clean surplus relation, re-arranging and dividing by the beginning period price, Equation (3) takes the following form:

(4) $$\frac{\Delta P_t + d_t}{P_{t-1}} = \frac{x_t}{P_{t-1}}$$

The left-hand side of Equation (4) is the stock return from *t–1* to *t*. Hence, assuming no economic rents and a one-to-one relation between market and book values, the levels of earnings should be a suitable variable in the ERC estimation. Second, if $\omega = 1$ *and* $\nu = 0$ then Equation (2) reduces to:

(5) $$P_t + d_t = \left(\frac{1+r}{r}\right)x_t$$

Equation (5) expresses the cum-dividend value as a multiple of current earnings. Taking first differences of price and earnings and dividing by the beginning period price yields:

(6) $$\frac{\Delta P_t + d_t}{P_{t-1}} = \left(\frac{1+r}{r}\right)\left(\frac{\Delta x_t}{P_{t-1}}\right) + \frac{d_{t-1}}{P_{t-1}}$$

According to Equation (6), returns can be modelled as a function of changes in earnings. This model specification motivates the use of earnings changes in the ERC estimation.

Both Equations (3) and (5) rule out the combination of earnings and book value in equity valuation. As suggested in Equation (2), the stock price is a function of both book value and earnings. Assuming that $0 < \omega < 1$ *and* $\nu = 0$, taking first differences, invoking the clean surplus assumption and then rearranging terms yields the following model:

(7) $$\frac{\Delta P_t + d_t}{P_{t-1}} = k\left(\frac{1+r}{r}\right)\left(\frac{\Delta x_t}{P_{t-1}}\right) + (1-k)\frac{x_t}{P_{t-1}} + k\frac{d_{t-1}}{P_{t-1}},$$

Equation (7) demonstrates that the stock return is a function of earnings changes, earnings levels, and prior period dividends. According to the theoretical model (Equation 2), their relative importance is determined by the auto regressive parameter, ω.

Our final theoretical relation is based on the complete Ohlson model. Unlike prior models this model contains both accounting information and other information. Adding changes in other information (Δv_t) to the above model yields a change specification of Equation (2):

$$(8)\qquad \frac{\Delta P_t + d_t}{P_{t-1}} = k\left(\frac{1+r}{r}\right)\left(\frac{\Delta x_t}{P_{t-1}}\right) + (1-k)\frac{x_t}{P_{t-1}} + k\frac{d_{t-1}}{P_{t-1}} + \alpha_2\frac{\Delta v_t}{P_{t-1}}.$$

When applying Equation (8) to the empirical ERC estimations, the other information variable needs to be operationalized. In this study, analysts' earnings forecasts are used as a measure of the other information. This allows the investigation of the incremental value relevance of analysts' earnings forecasts with respect to published earnings.

3. RESEARCH DESIGN

In what follows, the empirical models for the ERC estimations based on the valuation models derived in Section 2 are presented. Since the valuation impact of accounting losses is found to be close to zero (see, for instance, Hayn 1995 and Martikainen 1997), the models are adjusted to control for the impact of losses. Theoretical relations between stock returns and earnings variables derived in Section 2 do not include an intercept. However, since there are likely to be other factors outside these relations that determine the change in stock price, an intercept term is included to capture the fixed effects of these factors in the empirical models. Another deviation from the theoretical relations is the absence of dividends in some of the empirical models. Dividends are not included to facilitate comparisons with prior studies.

In the first stage of the empirical analyses, the following pooled OLS regressions are estimated:

$$(9)\qquad r_t = \alpha^a + \beta^a x_t / P_{t-1} + \delta^a (loss \times x_t) / P_{t-1} + \varepsilon_t^a,$$

$$(10)\qquad r_t = \alpha^b + \beta^b f_t / P_{t-1} + \varepsilon_t^b,$$

$$(11)\qquad r_t = \alpha^c + \beta^c \Delta x_t / P_{t-1} + \delta^b (loss \times \Delta x_t) / P_{t-1} + \varepsilon_t^c,$$

$$(12)\qquad r_t = \alpha^d + \beta^d \Delta f_t / P_{t-1} + \varepsilon_t^d,$$

$$(13)\quad r_t = \alpha^e + \beta^e x_t / P_{t-1} + \beta^f \Delta x_t / P_{t-1} + \delta^c (loss \times x_t) / P_{t-1} + \delta^d (loss \times \Delta x_t) / P_{t-1} + \varepsilon_t^e$$

$$(14)\quad r_t = \alpha^f + \beta^g f_t / P_{t-1} + \beta^h \Delta f_t / P_{t-1} + \varepsilon_t^f$$

$$(15)\quad r_t = \alpha^g + \beta^i x_t / P_{t-1} + \beta^j \Delta x_t / P_{t-1} + \beta^k \Delta f_t + \delta^e (loss \times x_t) / P_{t-1} + \delta^f (loss \times \Delta x_t) / P_{t-1}) + \varepsilon_t^g$$

$$(16)\quad r_t = \alpha^h + \beta^l x_t / P_{t-1} + \beta^m \Delta x_t / P_{t-1} + \beta^n f_t + \beta^o \Delta f_t + \delta^g (loss \times x_t) / P_{t-1} + \delta^h (loss \times \Delta x_t) / P_{t-1}) + \varepsilon_t^h$$

where $r_t = (P_t - P_{t-1} + d_t) / P_{t-1}$, and r_t is the stock return for year t calculated from July$_{t-1}$ to June$_t$, x_t is the annual earnings in year t, P_{t-1} is the market value of the firm at the beginning of the return period,Δx_t is the change in annual earnings in year t, f_t is the analysts' consensus earnings forecast for year $t+1$ issued on the last Wednesday in June year t, Δf_t equals change in analysts' forecast, i.e. the change in next period forecast between $t-1$ and t, *loss* is a dummy variable taking the value of 1 if the earnings for period t are negative and 0 otherwise[3],α is an intercept term, β is the estimated slope coefficient, and e_t is an error term with zero mean and constant variance. Following the previous literature in the field, all regression models are divided by the opening stock price to reduce the presence of heteroscedastic disturbances. In addition, the heteroscedasticity consistent variance-covariance matrix suggested by White (1980) are used in all regressions.

Inferences regarding the validity of the alternative model specifications are based on the significance of the estimated slope coefficients, i.e. ERCs in equations (9)–(16) that measure the effect of one Swedish krona of levels/changes of earnings/analysts' earnings forecasts on the stock return. In addition, the strength of the association between different earnings measures and returns is assessed by comparing the adjusted R^2. The research design makes it possible to study the actual, relative and combined value relevance of earnings levels and changes. In addition, the importance of analysts' forecasts in explaining returns can be investigated. The regression models are discussed in detail below.

Model (9) is the empirical counterpart of Equation (4). A number of prior studies analyze the relation between returns and accounting earnings (see, for instance, Easton and Harris 1991, Kothari and Zimmerman 1995, and Dumontier and Labelle 1998). In order to facilitate a com-

3 Losses dummies are used only for the reported earnings, because the low value relevance of accounting losses is based on the hypothesis that the stock market believes current losses to be temporary by nature and assumes future earnings to be positive (see Hayn 1995). This hypothesis does not necessarily hold true for the analysts' earnings forecasts.

parison between earnings and analysts' earnings forecasts in terms of value relevance, an empirical counterpart of Equation (4) based on analysts' forecasts, i.e. Model (10) is also estimated. Models (11) and (12) containing changes as independent variables are derived from the theoretical relation given in Equation (6). The use of analysts' earnings forecasts and changes in analysts' forecasts to model changes in the stock price is also intuitively appealing, because most of the valuation models used by practitioners are based on forecasts of earnings or cash flows.

According to Equation (7) both earnings levels and earnings changes should be important attributes in explaining changes in value. Following Easton and Harris (1991), Francis and Schipper (1999) and Marton (1998), among others, Model (13) is estimated to investigate the incremental value relevance of levels and changes of reported earnings. In the same way, Model (14) is estimated to investigate the incremental value relevance of levels and changes of analysts' earnings forecasts.

Consistent with the change specification of the Ohlson model (Equation 8), Model (15) contains three explanatory variables. In addition to levels and changes of reported earnings, the model contains changes in analysts' earnings forecasts as a proxy for other information. In order to investigate the relative importance of all alternative earnings measures, Model (16) is estimated. The model contains levels and changes of reported earnings as well as the levels and change of the analysts' earnings forecasts. By using nested models of Model (16), the incremental explanatory power of each variable can be investigated.

4. DATA ENVIRONMENT

4.1. The Swedish stock market

The data used in the study consist of firms listed on the Swedish stock exchange, i.e. Stockholmsbörsen during the whole period from 1987 to 1998 for which the required data were available. Stockholmsbörsen is the leading Nordic stock market with an annual turnover of 4455,9 billion Swedish kronor (SKr) for the year 2000 (one SKr was approximately equal to 0,11 US dollars). In terms of the annual turnover, the Swedish stock market was the seventh largest stock market in Europe in 2000.[4] Like most of the stock markets in the world, Stockholmsbörsen was steadily growing in terms of trading volume and market value during the last decade. Moreover, the number of shares traded has been monotonically increasing during the research period. Except for the years 1987 and 1990, the change in the market return is positive. As the stock market has been growing, the number of professional financial analysts has increased as well.

4 Information about Stockholmsbörsen can be found at www.stockholmsborsen.se

The Swedish Society of Financial Analysts (SFF) was founded in 1970 and its initial activity focused on various accounting and valuation issues. The first recommendation issued in 1975 dealt with earnings per share calculations. The level of activity has been increasing in later years including educational seminars and regular meetings with corporate executives, scientists and politicians. In addition, SFF has offered an educational program for certified financial analysts since 1990. The AMIR (Association for Investment Management and Research) program in US served as a model when this program was developed. Hence the level of sophistication of Swedish financial analysts has been increasing over the research period.

4.2 Sample selection

The sample includes firm-year observations of data for Swedish firms that were listed during the 1987–1998 period on the Stockholm stock exchange. Financial firms (banks and insurance companies) are excluded because of their different accounting practices. The sample is constructed by merging data from two sources. All data except for the analysts' earnings forecasts are collected from the publicly available Bonnier-Findata data base for firms that have a December fiscal year end. Analysts' earnings forecasts are obtained from the I/B/E/S data base. Bottom-line net income is used as a measure of accounting earnings (x_t). This earnings figure is most consistent with the clean surplus relation used to derive the theoretical returns-earnings relations. I/B/E/S has been collecting analysts' earnings forecasts for Swedish firms since 1987, which is the beginning year of the sample period. The I/B/E/S earnings forecasts (f_t) for period t + 1 are from June each year. This procedure ensures that the earnings information for year t is available when analysts make their forecasts. For example, if year t ends 12/31/1990 and earnings for year t is reported some time between 01/01/1991 and 06/30/1991, the consensus forecast is taken for the third Wednesday in June 1991.[5] This procedure is in line with Dechow et al. (1999) and Hand and Landsman (1999). At least two consecutive forecasts and earnings figures are required for the firm to be included in the sample. Monthly security return data adjusted for dividends needs to be available for each stock. Finally, stock prices at the last trading day in December and the number of stocks, both adjusted for stock splits and new issues, need to be available in the data base.

I/B/E/S provides forecasts on a per share basis. To avoid the possibility that I/B/E/S per share data reflect a different number of stocks compared to the Bonnier-Findata base, we first adjust the I/B/E/S data using the I/B/E/S correction factor to get the forecasts as they actually were as of the statistical period. Then we adjust the forecast using the adjustment factor con-

5 In Sweden, firms are obligated to present their financial report no later than six months after the accounting year ends. Unfortunately the exact reporting date is not available in the data base.

tained in the Bonnier-Findata data base. Finally, to ensure that the regression results are not unduly sensitive to statistical outliers, we delete the one percent tail of the distribution of each variable. After deletion the final sample consists of 1 145 observations.

5. EMPIRICAL RESULTS

5.1 Preliminary data analysis

Table 1 reports the descriptive statistics of the variables used in the empirical analyses. All variables are scaled by stock prices at the beginning of the return period for each year. Distribution statistics of the variables are reported in Panel A of Table 1. The mean (median) stock return, r_t, equals 0.195 (0.18) indicating the period of the bull market in the end of 1980s and after the mid of 1990s. The level of the reported earnings (x_t) has a mean of 0.067, whereas the corresponding figure for analysts' earnings forecasts is 0.086. The fact that there seems to be a slight upward bias in the analysts' earnings forecasts is commonly reported in the previous literature (see, for instance, Brown, 1997 and Richardson et al., 1999). The average price/earnings ratios based on reported earnings and next year earnings forecasts are 15 and 12, respectively.

Panel B of Table 1 reports the correlation matrix of the variables. Pearson correlation coefficients are given in the upper main diagonal and Spearman correlation coefficients in the lower main diagonal. The correlation between the accounting variables and the two variables based on analysts' forecasts ranges from 0.165 to 0.445. The highest correlation, 0.628, is reported between f_t and Df_t. The correlations between these two variables, though relatively high, are unlikely to be high enough to cause a multicollinearity problem. The correlation between returns and the independent variables is discussed in the next section where the results of the regression models are reported.

5.2 Return-earnings relation based on alternative model specifications

Table 2 reports the results of estimating models (9–12) in pooled regressions. The results indicate that both levels and changes of the reported earnings are statistically significantly related to returns even after controlling for the impact of losses. Accordingly, both levels and changes of analysts' earnings forecasts are significantly related to returns. The estimated ERC and adjusted R^2 are the highest when returns are regressed on analysts' earnings forecasts in Model (10). The estimated ERC and adjusted R^2 based on Model (10) are 1.740 ($p<0.001$) and 0.11, respectively. The lowest values of the estimated ERC and the adjusted R^2 are reported when returns are regressed on changes in reported earnings in Model (11).

Consistent with the results reported in many previous studies, the magnitudes of the esti-

TABLE 1. Descriptive characteristics of variables.

Panel A: Distributional statistics

Variable	Mean	Median	Std. deviation	Minimum	Maximum
r_t	0.195	0.180	0.357	-0.917	1.428
x_t	0.067	0.070	0.120	-0.818	0.516
f_t	0.086	0.080	0.069	-0.091	0.500
Δx_t	0.017	0.011	0.135	-0.665	0.998
Δf_t	0.014	0.008	0.068	-0.224	0.500

Panel B: Pooled Pearson and Spearman cross-sectional correlations

Variable	r_t	x_t	f_t	Δx_t	Δf_t
r_t	1	0.158 (<0.001)	0.334 (<0.001)	0.189 (<0.001)	0.296 (<0.001)
x_t	0.254 (<0.001)	1	0.445 (<0.001)	0.545 (<0.001)	0.165 (<0.001)
f_t	0.323 (<0.001)	0.552 (<0.001)	1	0.343 (<0.001)	0.628 (<0.001)
Δx_t	0.188 (<0.001)	0.566 (<0.001)	0.352 (<0.001)	1	0.431 (<0.001)
Δf_t	0.300 (<0.001)	0.214 (<0.001)	0.568 (<0.001)	0.398 (<0.001)	1

Notes. The table provides descriptive characteristics of the variables included in the study. r_t is the stock return for year *t* calculated from July$_{t-1}$ to June$_t$, x_t is the annual earnings per share in year *t*, f_t is the analysts' consensus forecast for year t + 1 issued in June of year t. Δx_t is the change in annual earnings in year *t*, Δf_t is the change in analysts' consensus forecast for the next period. In Panel B, Pearson correlations are reported in the upper main diagonal and Spearman correlations in the lower main diagonal. P-values for testing whether the correlations are different from zero are reported in parentheses.

mated ERCs reported in Table 2 are very low in terms of their economic interpretation. To illustrate, the value of the estimated ERC for the earnings changes (Model 11) is 0.639. Based on the simple earnings capitalization model, the annual expected rate of stock return implied by this estimate is 156% (=1/0.639), which is an unreasonably high number. Even the estimated ERC based on changes in analysts' earnings forecasts (Model 12) implies an expected rate of return of 64% (=1/1.563). Nevertheless, the results in Table 2 indicate that the returns-earnings models based on the analysts' earnings forecasts produce estimates of the ERCs that are much closer to their economically reasonable values than the models based on published earn-

TABLE 2. Earnings response coefficients based on different earnings measures.

Model	(9)	(10)	(11)	(12)
Constant	0.070 (4.12)***	0.045 (2.49)**	0.179 (16.21)***	0.172 (15.99)***
x_t	1.357 (9.39)***			
f_t		1.740 (11.20)***		
Δx_t			0.639 (6.19)***	
Δf_t				1.563 (9.14)***
$loss * x_t$	-1.897 (-7.39)***			
$loss * \Delta x_t$			-0.376 (-1.73)*	
$Adj.R^2$	0.082	0.110	0.038	0.087

Notes. The estimated models are as follows:

$$r_t = \alpha^a + \beta^a x_t/P_{t-1} + \delta^a((loss * x_t)/P_{t-1}) + \varepsilon_t^a \quad (9)$$

$$r_t = \alpha^b + \beta^b f_t/P_{t-1} + \varepsilon_t^b \quad (10)$$

$$r_t = \alpha^c + \beta^c \Delta x_t/P_{t-1} + \delta^b((loss * \Delta x_t)/P_{t-1}) + \varepsilon_t^c \quad (11)$$

$$r_t = \alpha^d + \beta^d \Delta f_t/P_{t-1} + \varepsilon_t^d \quad (12)$$

where r_t is the stock return for year *t* calculated from $July_{t-1}$ to $June_t$, P_{t-1} is the stock price at the beginning of the return period, x_t is the annual earnings per share in year *t*, f_t is the analysts' consensus forecast for year t + 1 issued in June of year t. Δx_t is the change in annual earnings in year *t*, Δf_t is the change in analysts' consensus forecast for the next period, *loss* is a dummy variable taking the value of 1 if earnings are zero or negative and otherwise the value zero, β is the estimated slope coefficient (the earnings response coefficients), and e_t is an error term. White's (1980) heteroscedasticity consistent covariance matrix is used for all the regressions to calculate standard errors. The t-statistics are in parentheses. A two-sided test is used for intercepts and a one-sided test for the slope coefficients. *, ** and *** represent significant at the 5%, 1% and 0,1% level respectively.

ings figures. The significantly negative slopes of the interaction terms *loss* * x_t and loss * Δx_t indicate that accounting losses have a negative valuation impact on stock returns.

The results in Table 2 confirm the validity of the alternative returns-earnings specifications derived from the accounting-based valuation model. Most importantly, the results support the use of analysts' earnings forecasts in this context. It seems that the information involved in analysts' earnings forecasts outperforms, at least to some extent, the information involved in reported earnings in terms of their value relevance. The market participants seem to put more focus on forecasted earnings information than reported earnings figures when setting prices. The lower value relevance of reported earnings relative to analysts' forecasts can be interpreted as accounting earnings being less informative about value changes. As discussed by Watts and Zimmerman (1996), the lower informativeness of the reported earnings may exist because accounting earnings are not being designed to measure value changes alone. Furthermore, in the presence of earnings management, the ability of reported earnings to measure value changes could be distorted further.

Table 3 reports the results of estimating models (13–16) in which the incremental importance of different earnings measures in returns-earnings models is investigated. The results of including both levels and changes of reported earnings (13) indicate that changes in reported earnings do not seem to contribute much in addition to levels of reported earnings when explaining returns. Similar results are reported by Easton and Harris (1991) and Marton (1998), among others. However, the results of regressing returns on levels and changes of analysts' earnings forecasts in model (14) indicate that the changes of the forecasted earnings have incremental information with respect to levels. The estimated ERCs based on levels and changes of the forecasted earnings are 1.269 (p-value <0.001) and 0.757 (p-value <0.001), respectively.

The theoretical relation given in Equation 8 suggests that a combination of reported and forecasted earnings can be used to model the changes in market values. Reported in Table 3 are the results of regressing returns on changes in analysts' forecasts and both earnings variables in the same model (Model 15). The estimated ERCs are 1.216 (p-value <0.001) for the accounting earnings variable and 1.370 (p-value <0.001) for the variable measuring changes in analysts' consensus forecasts. However, changes in accounting earnings do not remain significant. The information in forecast changes seems to subsume the information in reported earnings changes. The last column of Table 3 reports the results of estimating Model (16) that contains levels and changes of both the reported and forecasted earnings. The results indicate that the levels of the reported and forecasted earnings and the changes in the forecasted earnings are incrementally important in explaining stock returns. Adjusted R^2 is higher for Models 15 and 16 than for any of the other models. Overall, the results reported in Table 3 suggest that both the levels of the reported earnings and the levels and changes in analysts' forecasts are relevant in explaining returns, and the three variables are not just substitutes.

5.3 Sensitivity analyses

The results reported in the previous subsection are based on the pooled time-series and cross-sectional regression. In order to check the robustness of the results, this subsection provides

TABLE 3. Incremental information content of different earnings measures in returns-earnings relation.

Model	(13)	(14)	(15)	(16)
Constant	0.080	0.074	0.067	0.020
	(4.50)***	(3.84)***	(3.67)***	(0.94)
x_t	1.182		1.216	0.889
	(7.01)***		(6.95)***	(4.89)***
f_t		1.269		0.918
		(6.12)***		(4.26)***
Δx_t	0.222		-0.139	-0.056
	(1.93)**		(-1.13)	(-0.47)
Δf_t		0.757	1.370	0.799
		(3.42)***	(7.08)***	(3.35)***
$loss * x_t$	-1.948		-1.876	-1.668
	(-6.60)***		(-5.39)***	(-4.87)***
$loss * \Delta x_t$	0.221		0.312	0.311
	(0.98)		(1.40)	(1.41)
$Adj.R^2$	0.090	0.122	0.143	0.155

Notes. The estimated models are as follows:

$$r_t = \alpha^e + \beta^e x_t / p_{t-1} + \beta^f \Delta x_t/p_{t-1} + \delta^c (loss \times x_t)/p_{t-1} + \delta^d (loss \times \Delta x_t)/p_{t-1} + \varepsilon_t^e \quad (13)$$

$$r_t = \alpha^f + \beta^g f_t / p_{t-1} + \beta^h \Delta f_t/p_{t-1} + \varepsilon_t^f \quad (14)$$

$$r_t = \alpha^g + \beta^i x_t / p_{t-1} + \beta^j \Delta x_t/p_{t-1} + \beta^k \Delta f_t + \delta^e (loss \times x_t)/p_{t-1} + \delta^f (loss * \Delta x_t)/p_{t-1}) + \varepsilon_t^g \quad (15)$$

$$r_t = \alpha^h + \beta^l x_t / p_{t-1} + \beta^m \Delta x_t/p_{t-1} + \beta^n f_t + \beta^o \Delta f_t + \delta^g (loss \times x_t)/p_{t-1} + \delta^h (loss * \Delta x_t)/p_{t-1}) + \varepsilon_t^h \quad (16)$$

where r_t is the stock return for year *t* calculated from July$_{t-1}$ to June$_t$, P_{t-1} is the stock price at the beginning of the return period, x_t is the annual earnings per share in year *t*, f_t is the analysts' consensus forecast for year t + 1 issued in June of year t, Δx_t is the change in annual earnings in year *t*, Δf_t is the change in analysts' consensus forecast for the next period, *loss* is a dummy variable taking the value of 1 if earnings are zero or negative and otherwise the value zero, β is the estimated slope coefficient (the earnings response coefficients), and e_t is an error term. White's (1980) heteroscedasticity consistent covariance matrix is used for all the regressions to calculate standard errors and t-statistics. The t-statistics are in parentheses. A two-sided test is used for intercepts and a one-sided test for the slope coefficients. *, ** and *** represent significant at the 5%, 1% and 0,1% level respectively.

various sensitivity analyses. First, all the models are re-estimated cross-sectionally for each year in the sample period resulting in a time series of estimated annual ERCs. Their distributions are then used to test the statistical significance of the returns-earnings relations. This approach controls for the potential bias in the estimated ERCs that result from any cross-sectional correlation in the error terms. Second, all the models are re-estimated as random coefficient models by including annual dummy variables to control for the time variation in returns and by allowing random firm-specific intercepts and random ERCs. Third, industry-effects in the estimated ERCs are investigated.

Annual regressions

In the pooled cross-sectional and time-series regressions, the estimated slope coefficients may be biased due to correlation in error terms both in time and space. Bernard (1987) suggests that the distributions of the ERCs obtained from the annual regressions can be used to test whether the sample means of the estimated ERCs are statistically different from zero. If it is assumed that the annual cross-sectional regressions are independent, the distribution of the estimated annual ERCs can be used to test whether their sample means are statistically significantly different from zero.

Figure 1 depicts the time-series of the estimated annual ERCs based on single variable returns-earnings models (9–12). The annual variation in the estimated ERCs can clearly be seen from Figure 1, which supports the use of the annual cross-sectional regressions as a check of the robustness the results. In addition, it can be seen from Figure 1 that the estimated annual ERCs based on the levels and changes of the analysts' earnings forecasts (Models 10 and 12), are clearly higher than those based on the levels and changes of the reported earnings (Models 9 and 11). This finding strongly supports the results for the pooled data reported in Table 2.

Reported in Table 4 are the time-series means of the estimated annual cross-sectional ERCs and t-tests to test whether the annual ERCs are significantly different from zero. Results for the single variable returns-earnings models (Models 9–12) reported in the first Panel of Table 4 are in line with those reported in Table 2 indicating that the different earnings measures are significantly related to stock returns. The average ERCs reported in Table 4 are, however, lower than those reported in Table 2. This is especially the case for the changes and levels of the reported earnings. The second panel of Table 4 reports the averages of the estimated annual ERCs based on Models 13–16. These robustness checks confirm the results reported in Table 3, i.e. that the levels of the reported and forecasted earnings and the changes in the forecasted earnings are incrementally important in explaining stock returns.

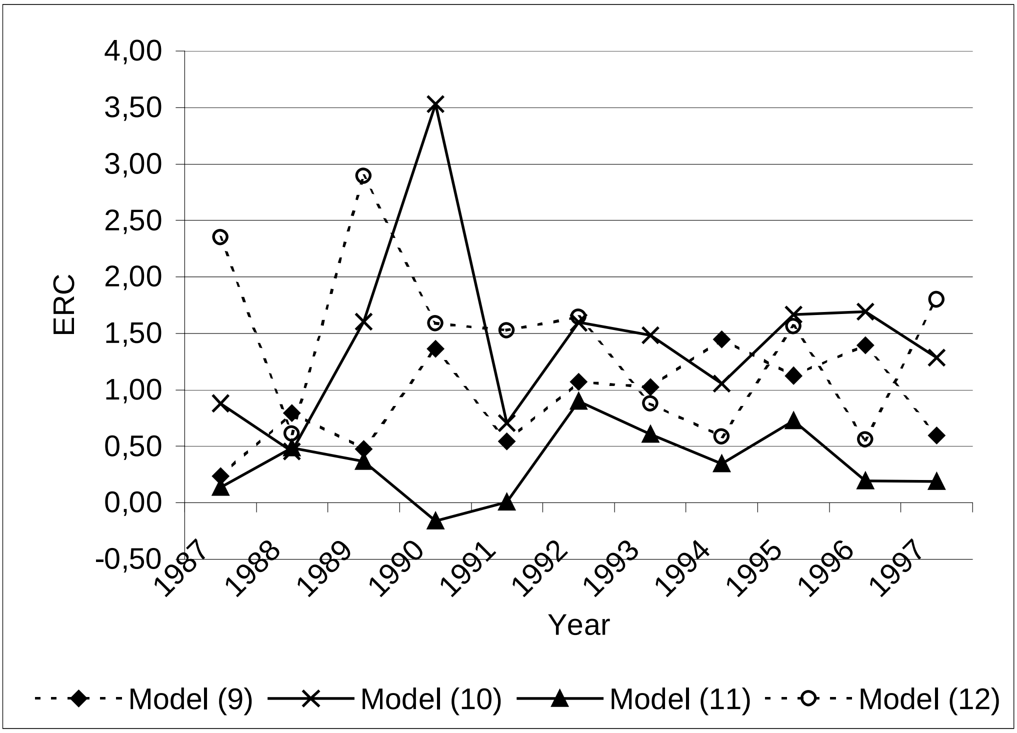

FIGURE 1. Annual cross-sectional earnings response coefficients.

Notes. The estimated models are as follows:

$$r_t = \alpha^a + \beta^a x_t / P_{t-1} + \delta^a ((loss * x_t) / P_{t-1}) + \varepsilon_t^a \qquad (9)$$

$$r_t = \alpha^b + \beta^b f_t / P_{t-1} + \varepsilon_t^b \qquad (10)$$

$$r_t = \alpha^c + \beta^c \Delta x_t / P_{t-1} + \delta^b ((loss * \Delta x_t) / P_{t-1}) + \varepsilon_t^c \qquad (11)$$

$$r_t = \alpha^d + \beta^d \Delta f_t / P_{t-1} + \varepsilon_t^d \qquad (12)$$

where r_t is the stock return for year *t* calculated from July$_{t-1}$ to June$_t$, P_{t-1} is the stock price at th beginning of the return period, x_t is the annual earnings per share in year *t*, f_t is the analysts consensus forecast for year t + 1 issued in June of year t + 1. Δx_t is the change in annual earnings i year *t*, Δf_t is the change in analysts' consensus forecast for the next period, *loss* is a dummy variabl taking the value of 1 if earnings are negative and otherwise the value zero, and ε_t is an error term Finally, β is the estimated slope coefficient, i.e. the earnings response coefficient (ERC) depicted i the figure.

TABLE 4. Time-series averages of the annual cross-sectional earnings response coefficients.

Panel 1: Models 9- 12

Model	(9)	(10)	(11)	(12)
Constant	0.094 (1.53)	0.061 (0.90)	0.164 (2.60)*	0.164 (2.66)*
x_t	0.916 (7.36)***			
f_t		1.450 (5.95)***		
Δx_t			0.345 (3.61)**	
Δf_t				1.455 (6.40)***
Average $Adj.R^2$	0.061	0.085	0.023	0.067

Panel 2: Models 13- 16

Model	(13)	(14)	(15)	(16)
Constant	0.087 (1.34)	0.086 (1.26)	0.082 (1.36)	0.049 (0.76)
x_t	0.955 (6.14)***		0.899 (5.33)***	0.690 (4.29)***
f_t		1.009 (3.00)**		0.639 (1.81)
Δx_t	-0.101 (-0.62)		-0.304 (-1.90)*	-0.293 (-1.88)*
Δf_t		0.928 (2.60)*	1.363 (5.10)***	1.149 (3.08)**
Average $Adj.R^2$	0.072	0.107	0.125	0.162

Notes. See Table 1 and 3 for details of the models estimated. Numbers in the table are the time-series averages of the slope coefficients (ERCs) of the annual regressions. t-statistics are based on the time series standard errors of the eleven yearly estimates. The t-statistics are in parentheses. A two-sided test is used for intercepts and a one-sided test for the slope coefficients. *, ** and *** represent significant at the 5%, 1% and 0,1% level respectively.

Random coefficient models with annual dummies

Table 5 reports the results of regressing returns-earnings model 9–12 by including annual dummy variables to control for the possible time-series variation in returns and by allowing random firm-specific intercepts and random slope coefficients of the earnings variables. In order to save space, the estimated coefficients of the annual dummy variables are not reported. The likelihood ratio test indicates that allowing random effects and controlling for potential time variation in returns improves the explanatory power of Models 11 and 12 in which returns are regressed on changes in earnings or changes in analysts' earnings forecasts. The estimated ERCs are, however, significantly positive although their values are slightly below those reported in Table 2. Consistent with the results reported in Table 2, the value of the log likelihood function is smallest for the (10) indicating that the best fit of the returns-earnings regressions is achieved when returns are regressed on analysts' earnings forecasts.

Industry effects

To further investigate the robustness of the results and to mitigate potential problems of variations in the estimated ERCs across firms, Models 9–12 are re-estimated by taking industry effects into account. To test for the differences in results across industries, 10 indicator variables are introduced to the returns-earnings models, one for each industry, respectively. The I/B/E/S industry classification is used to construct the indicator variables.[7] These indicator variables are interacted with each earnings measure in each model. The sector Basic Industries is used as the industry of reference. A significant coefficient on one of the interaction terms reflects the differential value effect of the earnings measure in this sector compared to the Basic Industries sector.

Table 6 reports the results of the four univariate return-earnings regressions with industry interactions included. Note that according to the I/B/E/S classification, investment companies and real estate companies are included in the finance sector. As previously mentioned, no banks or insurance companies are included in the study. The results for Model (9) show that the coefficients of the interaction terms are positive and statistically significant in three cases, i.e. Capital Goods (IND1), Consumer Service (IND4) and Technology (IND8), respectively. This

7 In the international data base, I/B/E/S classifies companies according to the 48 industries in the Morgan Stanley Capital International Perspective. These 48 industries are then classified by IBES into 11 market sectors and one Miscellaneous category. In the current sample six firm year observations were categorized as miscellaneous by I/B/E/S. Because of the limited numbers of observations in this category, we manually reclassified each of them into one of the IBES market sectors. Further, the sector Energy only contains 10 observations, so we merged it with the public utilities sector. Hence, altogether 10 different industries are investigated. The sector Basic Industries is used as the benchmark. Also note, that the sector Finance only contains real estate companies and investment companies.

TABLE 5. Earnings response coefficients based on random coefficient models. Intercepts and slopes of the earnings variables are allowed to vary across firms.

Model	(9)	(10)	(11)	(12)
Constant	0.142 (4.65) ***	0.105 (3.34)***	0.201 (6.87)***	0.188 (6.46)***
x_t	0.968 (7.69)***			
f_t		1.369 (9.48)***		
Δx_t			0.430 (4.42)***	
Δf_t				1.310 (7.30)***
$loss * x_t$	-1.034 (-4.08)***			
$loss * \Delta x_t$			-0.226 (-1.04)	
-2 log likelihood	415.1	392.5	445.8	415.2
LR-Test	10.87	2.36	27.31***	10.50*

Notes. The estimated models are as follows:

$$r_t = \alpha^a + \beta^a x_t/P_{t-1} + \delta^a((loss * x_t)/P_{t-1}) + \varepsilon_t^a \quad (9)$$

$$r_t = \alpha^b + \beta^b f_t/P_{t-1} + \varepsilon_t^b \quad (10)$$

$$r_t = \alpha^c + \beta^c \Delta x_t/p_{t-1} + \delta^b((loss * \Delta x_t)/p_{t-1}) + \varepsilon_t^c \quad (11)$$

$$r_t = \alpha^d + \beta^d \Delta f_t/p_{t-1} + \varepsilon_t^d \quad (12)$$

Although not reported, all regression models include annual dummies. A two-sided test is used for intercepts and a one-sided test for the slope coefficients. *, ** and *** represent significant at the 5%, 1% and 0,1% level respectively.

indicates that the ERCs based on reported earnings for these industries are, on average, higher than those for the Basic Industries sector. Regarding the Technology sector, positive and statistically significant interaction effects are also found in models (10) and (11). The effect of reported earnings levels and changes on returns seems to be more profound in this sector compared to the basic industries. This result is somewhat surprising since prior US studies (see, for instance, Amir and Lev, 1996) report that the value relevance of accounting figures is lower in the technology sector than in other industries. Nevertheless, the results reported in Table 6

TABLE 6. Earnings response coefficients when controlling for industry effects.

Model	(9)	(10)	(11)	(12)
Constant	0.142 (4.65) ***	0.105 (3.34)***	0.201 (6.87)***	0.188 (6.46)***
x_t	0.968 (7.69)***			
f_t		1.369 (9.48)***		
Δx_t			0.430 (4.42)***	
Δf_t				1.310 (7.30)***
$loss * x_t$	-1.034 (-4.08)***			
$loss * \Delta x_t$			-0.226 (-1.04)	
-2 log likelihood	415.1	392.5	445.8	415.2
LR-Test	10.87	2.36	27.31***	10.50*

Notes. The estimated models are as follows:

$$r_t = \alpha^a + \beta^a x_t/P_{t-1} + \delta^a((loss * x_t)/P_{t-1}) + \varepsilon_t^a \quad (9)$$

$$r_t = \alpha^b + \beta^b f_t/P_{t-1} + \varepsilon_t^b \quad (10)$$

$$r_t = \alpha^c + \beta^c \Delta x_t/p_{t-1} + \delta^b((loss * \Delta x_t)/p_{t-1}) + \varepsilon_t^c \quad (11)$$

$$r_t = \alpha^d + \beta^d \Delta f_t/p_{t-1} + \varepsilon_t^d \quad (12)$$

Although not reported, all regression models include annual dummies. A two-sided test is used for intercepts and a one-sided test for the slope coefficients. *, ** and *** represent significant at the 5%, 1% and 0,1% level respectively.

suggest that no major industry-related factors are driving the main results. Similar results based on Swedish data are found in Marton (1998).[8]

8 Marton (1998) and Runsten (1998) estimate the earnings level and change models (similar to model 13 in this paper) for different industries. Both studies use an industry classification of their own. Marton (1998) reports no industry effects in their results except for the utilities industry. Runsten (1998) reports similar results, except that the relation between returns and accounting figures is weak in the pulp and paper industry.

6. CONCLUSIONS

This paper investigates the role of analysts' earnings forecasts in contemporaneous association between stock returns and accounting earnings. The returns-earnings models investigated are the earnings levels and changes models and models including analysts' earnings forecasts based on the extended residual income model by Ohlson (1995). The different valuation impact of accounting losses and profits in the returns-earnings models is also investigated.

The results indicate that the analysts' earnings forecasts and changes in these forecasts are important in explaining stock returns. The forward-looking orientation of analysts' forecasts outperforms current earnings and earnings changes in explaining returns. Moreover, the findings indicate that the levels of the published earnings and the levels and changes of the analysts' earnings forecasts are significantly related to stock returns. The results also indicate that different earnings measures have incremental importance with respect to each other. The extended versions of the Ohlson (1995) residual income model seem to generate reasonable returns-earnings models in terms of their empirical validity. Consistent with the results of previous studies, the estimated earnings response coefficients (ERCs) turn out to be relatively low. Various sensitivity analyses including random coefficient models, annual cross-sectional regressions and industry-level models are conducted to check for the robustness of the results. The outcome of the pooled time series cross-sectional regressions seems to be fairly robust with regard to these tests. ■

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