Fundamental Valuation of Extra-Financial Information

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Abstract: In this study, we augment seminal models based on Ohlson (1995) by integrating the value impact of ratings related to three different extra-financial categories, i. e. corporate governance, human capital, and innovation capital. For a sample of large European public firms, we find that a model including human capital information and analysts' earnings forecasts best explains current stock prices. Our model based on human capital information (without analysts' forecasts) best identifies under- and overvalued companies and is thus useful for generating future positive hedge returns. This supports the findings of Dechow et al. (1999), who hold that models incorporating analysts' forecasts are superior in explaining contemporaneous market prices and models lacking this information exhibit the greatest predictive ability. We find that extra-financial information indeed conveys value relevant information beyond accounting figures and analysts' earnings forecasts.

Keywords: Capital markets; Extra-financial information; Information dynamics; Ohlson (1995) model; Valuation models

JEL-Classification: J24, M41

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1. Introduction

In this study, we analyze whether extra-financial information (EFI) is useful for explaining firms' current market prices and for identifying under- and overvalued firms. We use the term EFI because it lends a broader connotation than intangible assets or intellectual capital. We specifically study the effects of corporate governance (CG), human capital (HC), and innovation capital (IC) information. The remainder of the introduction is structured as follows: First, we present empirical evidence for the relationship between EFI and company performance, respectively the stock price. Then, we map the theoretical link between EFI and the residual income used to determine the fundamental value of a company. Finally, we give an overview of the implemented valuation models based on Ohlson (1995) and pose our research questions.

The notion whether EFI contributes in determining the fundamental value of firms is supported by growing literature dealing with corporate market value and book value. Many studies attribute extra-financials to the discrepancy between a firm's book value and market value. Among these studies is Sáenz (2005), who examines the relationship between human, structural and relational capital indicators and the market-to-book ratio for banks in Spain. He finds a positive relationship between HC indicators and the market-to-book ratio. Amir and Lev (1996) investigate the value relevance of financial and non-financial information in the cellular communications industry and Deng et al. (1999) look at the ability of patent-related measures to predict stock returns and market-to-book ratios.

Daniel and Titman (2006), a recent study that examines the book-to-market effect on stock returns, takes an innovative approach that distinguishes between information on tangible and intangible assets. Tangible assets are defined as measures of past accounting-based performance and intangible assets as the component of news about future performance, which is unrelated to past performance. Daniel and Titman (2006) show that future stock market performance can be explained by past intangible asset information, but not by past tangible asset information. They argue that there is a negative relationship between past intangible assets information and future performance which can be best explained by investors who overreact to intangible assets information. With respect to stock returns, Edmans (2007) finds that Fortune magazine's "Best companies to work for in America" earned 14% per year over 1998-2005, which is double the market return. They outperformed market, industry and characteristics benchmarks at long-horizons. Aggarwal et al. (2007) compare the CG of foreign firms with the governance of similar U.S. firms. They find that firms with independent board and audit committees are valued higher. In contrast, they observe that the separation of the chairman of the board and of the CEO functions, for example, is not associated with higher shareholder wealth. Using Tobin's q and the return on assets as measures of performance, Jermias (2007) finds that managerial share ownership has a positive effect on the relationship between companies' R & D intensity and performance. However, the aforementioned CEO duality has a negative effect on the relationship. Völckner and Pirchegger (2006) confirm the importance of intangible assets. They find from a survey of German companies that managers regard intangible assets as important value drivers. However, they document that current practices in measurement, management, and reporting of intangible assets are not in line with the requirements postulated in the literature.

The idea for including EFI in the residual income dynamics of an Ohlson (1995) type-model is linked to the following arguments. First, EFI can be a source of competitive advantage or disadvantage. This is e. g. underpinned by strategic management theory. Building on Barney (1991) and Grant (1991), a firm can establish a sustainable competitive advantage when it manages to establish rare, inimitable, valuable, and non-substitutable capabilities based on its resources. According to Barney (1991: 101), firm resources include “all assets, capabilities, organizational processes, firm attributes, information, knowledge, etc. controlled by a firm that enable the firm to conceive of and implement strategies that improve its efficiency and effectiveness.” Hence, IC, HC, and CG represent these resources.

Second, there are several theoretical links between EFI and firm performance that in turn drive the yield on stock and the market value of a firm. For IC, Crépon et al. (1998), develop a structural model that explains productivity by innovation output and innovation output by research investments. Crépon et al. (1998: 115) find that “firm innovation output, as measured by patent numbers or” innovative “sales, rises with its research effort and with the demand pull and technology indicators, either directly or indirectly through their effects on research.” Further, “firm productivity correlates positively with a higher innovation output, even when controlling for the skill” composition “of labor as well as for physical capital intensity.”

A theoretical link between superior human resource management and positive financial outcomes is e. g. given by Guest (1997). Becker and Huselid (1998: 53) focus on the “potential of a high performance work system to serve as an inimitable resource supporting the effective implementation of corporate strategy and the attainment of operational goals.” They provide a model that shows how the market value of a company is driven by human resource management.

According to the principal agent theory, agency costs emerge due to a conflict of interests between shareholders and managers (see Jensen and Meckling (1976)). Agency costs can result in lower cash flows to the shareholders (see La Porta et al. (2000)). CG is a set of mechanisms through which outside investors protect themselves or are protected against expropriation by managers. Although agency costs cannot be completely eliminated, they can be reduced by good CG.

Based on theoretical models and empirical studies, the link between a specific EFI category and corporate performance is not always positive. Chan et al. (2001: 2432), for example, argue that many R&D intensive firms have few tangible assets and "their prospects are tied to the success of new, untested technologies and hence are highly unpredictable." Third, we assume that in our study superior (inferior) rated EFI is a source of competitive advantage (disadvantage), as the ratings we use are based on criteria for assessing the competitive position of a company resulting from its CG, HC, and IC. Fourth, it is important to mention that the EFI we include in the models is predominantly not reflected by the accounting system by design and thereby contains additional information content. The extra-financial ratings impose heavy weight on the change of criteria. It will take time for the accounting system to absorb this new information. Finally, a company will earn an additional positive (negative) residual income when it has a competitive advantage (disadvantage). Since the EFI in period t contains additional information about the competitive advantage in t+1, we use this information to predict the residual income of period t+1. This logic applies also for periods after t+1. Hence, it is our hypothesis that future residual income can be better predicted in a linear information model by considering EFI. If this hypothesis cannot be rejected, the fundamental value of a company which is based on future RI should be able to be more precisely determined.

When capital markets are efficient in the semistrong form (see Fama (1991)), and EFI is relevant and available to market participants, we expect this information to be reflected in present stock prices. We explicitly estimate linear information dynamics similar to those proposed by Ohlson (1995) to determine fundamental market values.[1] Thereby, we modify three commonly used empirical versions of the Ohlson (1995) model by additionally including EFI in the linear information model (LIM). As proxies for EFI we consider CG, HC and IC ratings based on publicly available information only. We analyse a model that is based on Ohlson (1995) but does not include the "other information" variable ν in the LIM (model *Ia*). This model has already been empirically implemented by Myers (1999), for example. In a second model, we additionally include EFI in our LIM (*Ib*). Model *IIa* is based on Ohlson (2001) who shows how to account for "other information" ν by assuming that next period expected earnings are observable with the help of analysts' earnings forecasts. "The term ν summarizes information that is captured in a firm's stock price because of its ability to predict future abnormal earnings, but is not yet reflected in the firm's financial statement" (Hand and Landsman (1998: 2)). The "other information" variable is calculated based on earnings expectations and current accounting data. Model *IIa* was tested by Dechow et al. (1999) and Pfeil (2003), for example. To determine whether EFI has information content beyond analysts' forecasts and accounting figures, we develop our own model *IIb*. As stated by Callen and Segal (2005: 409), "studies by Dechow et al. (1999), Myers (1999), Callen and Morel (2001) and Morel (2003) provide extensive empirical evidence that the Ohlson (1995) model is of limited empirical validity." One reason for these results can be seen in the shortcoming of the Ohlson (1995) model to account for conservative accounting. For this reason we implement also model *IIIa* based on Choi, O'Hanlon and Pope (2006), in short COP (2006), who modified the Feltham and Ohlson (1995) model to test whether it can reduce problems related to unconditional conservatism. This model was also implemented by Henschke et al. (2007). Finally, our model *IIIb* is based on model *IIIa* and additionally includes EFI. Since the Feltham and Ohlson (1995) model is a generalisation of the Ohlson (1995) model, we call model *III* a specification of Ohlson (1995) in this study.[2]

We explore the following research questions for our sample of European firms:

1. Does a positive influence of EFI on next period's residual income exist? Can the residual income of the next period be better explained when EFI is considered?
2. Which of our different models is best in explaining current market prices? Does EFI make a difference?
3. Which of the considered models is most appropriate for predicting future stock performance by identifying under- and overvalued companies? Again, does EFI make a difference?

The major contribution of this study is to test whether EFI is relevant in explaining current stock prices and future stock returns. We therefore enhance existing linear information models by integrating EFI and testing the models' ability to explain current stock prices and predict future stock performance. The remainder of this paper is organized as follows. The basic Ohlson (1995) model is summarized in section 2. In section 3, we present the empirical versions of our linear information models. Section 4 describes EFI as well as employed financial and accounting data. In section 5, we test our hypotheses and present the results. Section 6 concludes our study.

2. Theoretical Background

This section summarizes the basic assumptions of the Ohlson model.[3] The model is based on the residual income valuation model. Ohlson (1995) creates an analytical specification of basic residual income valuation models enabling researchers to calculate future abnormal earnings and as a consequence the present value of a firm. For this reason, we present the residual income valuation framework and then the linear information dynamics introduced by Ohlson (1995).

Residual Income Model

First, the present value of expected dividends assumption is applied. It states that the firm value V_t is the present value of expected future dividends $d_{t+\tau}$:

$$V_t = \sum_{\tau=1}^{\infty} \frac{E_t[d_{t+\tau}]}{R^{\tau}}.$$

$E_t(\cdot)$ is the expectation operator, conditional on available information at time t and R is the discount factor 1 plus the cost of capital r.

The next assumption is the clean surplus relation which states that bv_t, the book value of equity at the end of period t, can be calculated by adding the earnings x_t of period t to the book value at the end of period t-1 and subtracting the net dividends d_t of period t:

$$bv_t = bv_{t-1} + x_t - d_t.$$

The residual income RI of period t is defined as

$$RI_t = x_t - r \cdot bv_{t-1}$$

where r is the cost of capital.

Combining the three equations above yields the basic equation of RI valuation:

$$V_t = bv_t + \sum_{\tau=1}^{\infty} \frac{E_t[RI_{t+\tau}]}{R^{\tau}}.$$

Next, we present Ohlson's (1995) framework for predicting future RI.

Ohlson's Information Dynamics

The linear information dynamics, also called the linear information model, basically consists of two equations in the Ohlson (1995) version. The first one predicts the RI of the next period based on the RI of the present period and based on "other information" ν_t. The "other information" is defined as value relevant information that can be observed at the end of period t but is not yet captured by the accounting system which means that the information is not reflected by x_t and bv_t. It is assumed that RI is only temporary, since a firm is not likely to earn abnormal returns in perpetuity in a competitive economy. For this reason, the equation includes a persistence parameter ω which is assumed to lie between zero and one:

$$RI_{t+1} = \omega \cdot RI_t + \nu_t + \varepsilon_{1,t+1}.$$ [4]

The second equation specifies the development of the "other information":

$$\nu_{t+1} = \gamma \cdot \nu_t + \varepsilon_{2,t+1}.$$

Since the influence of "other information" on RI is assumed to be temporary, the values of γ should also lie between zero and one. ω and γ are assumed to be fixed parameters over time. The disturbance terms $\varepsilon_{1,t+1}$ and $\varepsilon_{2,t+1}$ are unpredictable, zero-mean variables. Combining the two equations above delivers a forecast of expected future RI.

Ohlson (1995) derives the following closed form valuation function combining the linear information dynamics with the RI valuation framework:

$$V_t = bv_t + \alpha_1 \cdot RI_t + \alpha_2 \cdot \nu_t$$

where

$$\alpha_1 = \frac{\omega}{R - \omega} \text{ and } \alpha_2 = \frac{R}{(R - \omega)(R - \gamma)}.$$

Next, we modify this model to include EFI and to allow for conservative accounting as well.

3. Empirical Versions of Linear Information Models

In this section, we present six different information dynamics and the price equations that they imply. Basically, we present three different models each with two different specifications *a* and *b*. Version *b* of each model additionally incorporates EFI. We use three different kinds of EFI: CG, HC, and IC.[5]

The first LIM is based on RI and thus similar to the Ohlson (1995) model without "other information". Model *II* is based on model *I* but additionally incorporates analysts' forecasts. Model *III* is based on COP (2006) considering conservatism in the spirit of Feltham and Ohlson (1995).

Linear Information Model *I*

We first present the Ohlson model without “other information”. This model assumes that expectations of future RI are based on information about current RI only (abbreviated as *Ia-O* for the Ohlson model) or on information about current RI plus EFI (abbreviated as *Ib-OCG*, *Ib-OHC*, and *Ib-OIC* for the Ohlson model, including the respective kind of EFI). RI is assumed to change rather slowly over a longer period, since a competitive advantage or disadvantage is unlikely to cease to exist or to occur suddenly. Economic intuition concerning version *b* is that the EFI variable (ef) to a large extent is not reflected by the present equity book value and earnings. But it is publicly known and thus it can be better used to predict future RI.

The linear dynamics for version *Ib* is:

$$RI_{t+1} = \omega_1 \cdot RI_t + \omega_2 \cdot ef_t + \varepsilon_{1,t+1}, \tag{1}$$

$$ef_{t+1} = \beta_1 \cdot ef_t + \varepsilon_{2,t+1}, \tag{2}$$

where $\varepsilon_{k,t+1}$ with $k = 1$ and 2 are zero mean error terms and ef_t represents the different kinds of EFI at period t. For ef_t, we include the variables cg_t, hc_t, and ic_t for the CG, HC, and IC information, respectively.

This model implies the valuation equation:

$$V_t = bv_t + \alpha_1 \cdot RI_t + \alpha_2 \cdot ef_t, \tag{3}$$

where

$$\alpha_1 = \frac{\omega_1}{(R - \omega_1)} \quad \text{and} \quad \alpha_2 = \frac{\omega_2 \cdot R}{(R - \omega_1)(R - \beta_1)}.$$

In the above equations, ω_1 is the persistence parameter for abnormal earnings. In a competitive market, ω_1 is assumed to be smaller than one since a competitive advantage is assumed to erode in a competitive environment. Thus, competition will reduce RI towards zero. It is assumed to be non-negative since a competitive advantage will not induce a competitive disadvantage in the next period: $0 \leq \omega_1 < 1$. ef is assumed to trend to zero over time because an advantage or disadvantage based on extra-financials should also be transitory in a competitive environment. Thus, we assume β_1 to lie between zero and one. Further, the parameter ω_2 should be positive because we assume that superior EFI is an indicator for a competitive advantage. ω_2 is not necessarily smaller than 1. This is because ef is trending towards zero: $0 \leq \beta_1 < 1$ and $\omega_2 > 0$. Version *Ia* is a reduced form of *Ib*: As ef_t is zero, $\alpha_2 \cdot ef_t$ vanishes in the valuation equation (3).

Linear Information Model *II*

As for model *I*, we examine two different versions of LIM *II*. However, for LIM *II* we explicitly describe both versions (*IIa* without and *IIb* with EFI) as they are a little bit more involved. In LIM *IIa*, we follow a procedure for calculating the “other information“ variable ν_t that was suggested by Ohlson (2001). The basic idea of the approach is that future RI is forecasted on the basis of current RI and “other information“ using analysts’ earnings forecasts. Prior studies following this approach include Dechow et al. (1999), Hand and Landsman (2005), as well as McCrae and Nilsson (2001).

LIM *IIa* (abbreviated as *IIa-OA* for the Ohlson model including analysts' forecasts) is based on the following information dynamics:

$$RI_{t+1} = \omega_1 \cdot RI_t + \nu_t + \varepsilon_{1,t+1}, \tag{4}$$

$$\nu_{t+1} = \gamma_1 \cdot \nu_t + \varepsilon_{2,t+1}. \tag{5}$$

Ohlson (2001) suggests measuring ν_t as the difference between the expected RI for period t+1 based on market's expectations in period t and the forecast based on the current period RI only:

$$\nu_t = E_t[RI_{t+1}] - \omega_1 \cdot RI_t.$$

In line with prior studies we use for the period t conditional expectation of period t+1 earnings the consensus analysts' forecast of period t+1 earnings, denoted f_t:[6]

$$E_t[RI_{t+1}] = f_t^a = f_t - r \cdot bv_t.$$

Then ν_t can be measured as:

$$\nu_t = f_t^a - \omega_1 \cdot RI_t.$$

This means that the "other information", ν_t, is the difference between abnormal analysts' earnings forecasts and the expected residual income in t+1, based on the linear information dynamics of model *Ia*.

LIM *IIa* implies the following valuation equation:

$$V_t = bv_t + \alpha_1 \cdot RI_t + \alpha_3 \cdot \nu_t, \tag{6}$$

where

$$\alpha_1 = \frac{\omega_1}{R - \omega_1} \text{ and } \alpha_3 = \frac{R}{(R - \omega_1)(R - \gamma_1)}.$$

The parameter value of γ_1 depends on ω_1 since the latter is used for calculating ν_t. ω_1 is smaller than one in a competitive market and the influence of ν_t is also assumed to trend to zero: $0 \le \omega_1 < 1$, and $0 \le \gamma_1 < 1$. $\varepsilon_{k,t+1}$ with $k = 1$ and 2 are zero mean error terms.

LIM *IIb* is a combination of LIM *Ib* and *IIa*. We implement this model to examine the value of EFI when analysts' forecasts are already considered in the model (abbreviated as *IIb-OACG*, *IIb-OAHC*, and *IIb-OAIC* for the Ohlson model, including analysts' forecasts and the respective kind of EFI). The notion is that extra-financials contain relevant information beyond RI and analysts' forecasts.

LIM *IIb* is based on the following information dynamics:

$$RI_{t+1} = \omega_1 \cdot RI_t + \omega_2 \cdot ef_t + \nu_t + \varepsilon_{1,t+1} \tag{7}$$

$$\nu_{t+1} = \gamma_1 \cdot \nu_t + \varepsilon_{2,t+1} \tag{5}$$

$$ef_{t+1} = \beta_1 \cdot ef_t + \varepsilon_{3,t+1}, \tag{2}$$

where $\varepsilon_{k,t+1}$ with $k = 1,2,3$ are zero mean error terms and ef_t represents EFI. Equation (5) reminds us of LIM *IIa* and equation (2) of LIM *Ib*.

Here, we estimate the "other information" variable, ν_t, as the difference between the expected RI based on market's expectations in period t of RI for t+1 and the anticipated RI based on the current period RI plus the effect of EFI:

$$\nu_t = f_t^a - [\omega_1 \cdot RI_t + \omega_2 \cdot ef_t].$$

Thus, in this model, ν_t is information known to the market concerning RI of period t+1 by using analysts' forecasts minus information known by extrapolating historical accounting figures and EFI. In both versions, *IIa* and *IIb*, the expected RI for period t+1 is f_t^a. However, from period t+2 on, the information dynamics yields different forecasts for RI.

This model implies the following valuation equation:

$$V_t = bv_t + \alpha_1 \cdot RI_t + \alpha_2 \cdot ef_t + \alpha_3 \cdot \nu_t, \qquad (8)$$

where

$$\alpha_1 = \frac{\omega_1}{R - \omega_1}, \quad \alpha_2 = \frac{\omega_2 \cdot R}{(R - \omega_1)(R - \beta_1)} \quad \text{and} \quad \alpha_3 = \frac{R}{(R - \omega_1)(R - \gamma_1)}.$$

ω_1 will be smaller than one in a competitive market and the influence of ef_t and ν_t is also assumed to trend to zero. Thus, β_1 and γ_1 are between zero and one. ω_2 is assumed to be positive: $0 \le \omega_1 < 1, 0 \le \beta_1 < 1, 0 \le \gamma_1 < 1, \omega_2 > 0$.

Linear Information Model *III*

Most studies testing the Ohlson (1995) or the Feltham and Ohlson (1995) model find that the estimates of firm values are negatively biased.[7] The negative bias of the Ohlson model is explained in the literature by the violation of the assumption of unbiased accounting and thus by the shortcoming to allow for conditional and unconditional conservatism. The Feltham and Ohlson (1995) model incorporates a conservatism coefficient to account for unconditional conservatism. In contrast to their model, this coefficient is negative in most empirical studies.[8] Thus, the model is not able to capture unconditional conservatism in an appropriate way. Choi, O'Hanlon and Pope (2006), for short COP (2006), modified the Feltham and Ohlson (1995) model to mitigate this problem. COP (2006: 76) argue that, if the "assumed dependence between book value and expected future RI does not reflect information about the mean" of "other information" ν_t, "this characterization of accounting conservatism will not capture the anticipated unwinding of conservatism that is implied when average RI in the estimation period is negative and average OI is positive" because "intrinsic value estimates contain a conservatism-related bias".

We test the COP (2006) modification in LIM *IIIa* (abbreviated as *IIIa-COP*) and additionally include EFI in LIM *IIIb* (abbreviated as *IIIb-COPCG*, *IIIb-COPHC*, and *IIIb-COPIC* for the COP (2006) model, including the respective kind of EFI). The logic for including EFI is as already mentioned above: we argue that it contains additional information besides accounting figures and analysts' forecasts.

LIM *IIIb* has the following linear dynamics:

$$RI_{t+1} = \omega_0 \cdot bv_t + \omega_1 \cdot RI_t + \omega_2 \cdot ef_t + \nu_t + \varepsilon_{1,t+1}, \qquad (9)$$

$$bv_{t+1} = G \cdot bv_t + \varepsilon_{2,t+1}, \qquad (10)$$

$$\nu_{t+1} = \gamma_0 \cdot bv_t + \gamma_1 \cdot \nu_t + \varepsilon_{3,t+1}, \qquad (11)$$

$$ef_{t+1} = \beta_1 \cdot ef_t + \varepsilon_{4,t+1}, \qquad (2)$$

where $\varepsilon_{k,t+1}$ with $k = 1, 2, 3,$ and 4 are zero mean error terms. ω_0 and γ_0 are conservatism parameters. The persistence parameters ω_1, β_1 and γ_1 are assumed to have the following range: $0 \le \omega_1 < 1$, $0 \le \beta_1 < 1$ and $0 \le \gamma_1 < 1$. G $(1 \le G < R)$ represents one plus the growth rate of book value. In equation (9), ef_t is zero for LIM *IIIa* and equation (2) also disappears.

We calculate ν_t as the difference between the expected RI based on analysts' earnings forecasts for period t+1 and the expectation of RI for period t+1 based on the RI dynamics. Since the RI dynamics varies between LIM *IIIa* and *IIIb*, ν_t varies between the two versions. For version *a* (this is the model without EFI), ν_t is

$$\nu_t = f_t^a - (\omega_0 \cdot bv_t + \omega_1 \cdot RI_t)$$

and for version *b* (with EFI) it is

$$\nu_t = f_t^a - (\omega_0 \cdot bv_t + \omega_1 \cdot RI_t + \omega_2 \cdot ef_t).$$

As in models *IIa* and *IIb*, the expected RI for period t+1 is f_t^a for models *IIIa* and *IIIb*, too. From period t+2 on, the information dynamics yield different forecasts for RI. In order to illustrate the different RI dynamics, the evolution of expected RI is shown for the company Saint Gobain in figures 1a and 1b.

LIM *IIIb* implies the following valuation equation:

$$V_t = (1 + \alpha_4 + \alpha_5) \cdot bv_t + \alpha_1 \cdot RI_t + \alpha_2 \cdot ef_t + \alpha_3 \cdot \nu_t, \qquad (12)$$

where

$$\alpha_1 = \frac{\omega_1}{R - \omega_1}, \quad \alpha_2 = \frac{\omega_2 \cdot R}{(R - \omega_1)(R - \beta_1)}, \quad \alpha_3 = \frac{R}{(R - \omega_1)(R - \gamma_1)},$$

$$\alpha_4 = \frac{\omega_0 \cdot R}{(R - \omega_1)(R - G)}, \text{ and } \alpha_5 = \frac{\gamma_0 \cdot R}{(R - \omega_1)(R - \gamma_1)(R - G)}.$$

LIM *IIIa* does not contain the term $\alpha_2 \cdot ef_t$ in (12).

4. Data Sample and Extra-Financial Information

Financial information is obtained from Thomson Financial Datastream and EFI is represented by ratings from The Value Group.[9] The ratings are based on information published by the rated companies. The initial sample consists of 150 companies of the EURO STOXX with the largest free float market capitalization for the time period 2004-2005. We do not consider EFI before 2004 and also do not include companies with less free float market capitalization due to poor public EFI data availability. In line with prior studies, we exclude all financial companies that have a SIC code starting with 6 (46 companies). We furthermore eliminate companies when only preferred stock is listed because we value common stock (2 companies). We also delete firms with a negative book value since their future prospects are uncertain and companies with missing financial data (14 companies). Finally, companies with missing ratings are excluded (29 companies). Thus, we end up with 59 companies in our sample.

We use Datastream to collect annual accounting data on earnings, book values of equity, and value added which we define as earnings before interest and taxes plus salaries. Furthermore, it is important to note that extraordinary items are not stated separately under IFRS. For this reason, we calculate RI based on net income available to common. Earlier empirical research (e. g. Dechow et al. (1999), Myers (1999)) uses earnings before extraordinary items because extraordinary items are nonrecurring, and so their inclusion is unlikely to enhance the prediction of RI. However, our approach corresponds with the Ohlson (1995) model based on a clean surplus accounting system. Further, it must be mentioned that in IFRS, as well as in US-GAAP, the clean surplus relation is violated to some extent.[10] We use restated data from Thomson Financial (restatement reason code: change in GAAP followed) for the year 2004, when a firm changed from local GAAP to IFRS in 2005. The restated book value of equity for the year 2003 that we need to calculate the RI for the year 2004 is hand-collected from the year 2005 annual report when a firm was switching to IFRS.[11] From 2005 on, no firm applied local GAAP. So we assure that all accounting data used in this study are based on IFRS or US-GAAP. A one year ahead median earnings forecast from I/B/E/S is also obtained via Datastream. We take the forecasts of the Thursday before the third Friday of the sixth month after the end of a firm's fiscal year. With this procedure, we assure that accounting information is in fact available to analysts. Also, The Value Group ratings are based on information publicly available six months after the fiscal year.

We obtain the free float market value, stock prices and the return index of the EURO STOXX from Thomson Financial for the years 2000-2007 and the ten year Euro benchmark bond interest rate which is used as the risk free interest rate for the years 2002-2005 for the linear information models. As opposed to a price index, we use a net return index of the EURO STOXX because there is no total return index of the EURO STOXX. Valuation figures as well as stock prices are adjusted for stock splits. The latter are also adjusted for dividends distributed during the six months following the end of the fiscal year where appropriate. The predictive power of the models is tested using buy-and-hold total stock returns and the Sharpe Ratio. The risk free interest rate for the Sharpe Ratio is proxied by the one year German treasury bond issued at 2006-06-30.

We obtain three different extra-financial ratings from The Value Group: (i) Corporate governance (CG): Assessment of the adoption of processes and rules for solid governance which assure that shareholders receive an adequate return on their investment. (ii) Human capital (HC): Assessment of how a firm manages to establish an environment and processes so that employees deliver their optimum to the firm‘s success. (iii) Innovation capital (IC): Assessment of a firm’s current innovation success as well as its efforts to assure future capabilities for innovation. According to The Value Group, all data used to generate the extra-financial ratings are published by the companies in annual, social and other company reports. This distinguishes the ratings used in this study from other available ratings in this field where also private information is processed. The ratings are based on scoring models that primarily incorporate quantitative data. The HC rating, for example, is based on the category Training and on the category Motivation/Retention/Satisfaction. Both consist of several indicators. Training e. g assesses the annual number of training days per employee, especially the change over time. Motivation/Retention/Satisfaction examines the change in annual employee turnover and the change in the number of employees, for example. Each rating evaluates companies on a scale from 0 to 10 with 10 as best rating score. Neither market value nor book value or RI, i. e. accounting or processed accounting figures, enters the ratings. Figure 2 presents histograms for the rating values of the three different ratings in the year 2005.

Table 1 depicts the Pearson correlation coefficients for the different extra-financial ratings of the years 2004 and 2005. As can be seen from the table, the correlation between the same rating categories of 2004 and 2005 is always positive (although not significantly different from zero for HC). Focusing on the different ratings, one can see that CG and HC ratings are generally negatively correlated whereas there is a positive correlation between CG and IC. The correlation between IC and HC ratings is generally positive with the exception of IC 2005 and HC 2005. Generally, the correlations between the different ratings are not statistically significantly different from zero (with the exception of IC 2005 and CG 2005).

[Insert table 1 and figure 2 about here]

5. Results

Descriptive Statistics

Table 2 reports annual summary statistics. It is based on all observations for the included 59 EURO STOXX companies. The median return-on-equity is very high for the years 2004 and 2005 and there are almost no negative values for the return-on-equity in both years. This is due to the booming economic environment in Europe in both years. Thus, more than 80% of RI is positive using an equity cost of capital of 8.09% for calculating RI in 2004 and 7.39% in 2005.[12]

[Insert table 2 about here]

Model Estimation

In the following, we describe how the parameters needed for calculating the fundamental share price are estimated. We estimate the parameters for the different information dynamics above year-by-year cross-sectionally, since a firm-by-firm estimation does not make sense due to poor public EFI availability before 2004.

The parameter ω_1 is estimated in the cross-sectional regression $RI_{t+1} = \omega_0 + \omega_1 \cdot RI_t + \varepsilon_{t+1}$ for models *Ia*, *IIa*, and *IIIa*. For model *IIIa*, ω_0 is also estimated in this regression.

For models *Ib*, *IIb*, and *IIIb* ω_1 and ω_2 are estimated from $RI_{t+1} = \omega_0 + \omega_1 \cdot RI_t + \omega_2 \cdot ef_t + \varepsilon_{t+1}$. Depending on the model specification, ef_t is cg_t, hc_t or ic_t. In model *IIIb*, ω_0 is also estimated in this regression. To generate ef, we multiply the respective extra-financial rating[13] by the value added of a firm which is defined as earnings before interest and taxes plus salaries. The value added is a financial ratio to assess the value creation potential of a firm. Thus, it is a proxy to asses a firm's ability to take advantage of extra-financials. We use the value creation potential of the examined firms to transform their non-monetary ratings into a monetary variable. In our model, a superior extra-financial rating plus a high value added should generate a huge competitive advantage resulting in an additional RI.

For models *IIa* and *IIb*, γ_1 is estimated from the cross-sectional regression $\nu_{t+1} = \gamma_0 + \gamma_1 \cdot \nu_t + \varepsilon_{t+1}$ and for models *IIIa* and *IIIb* γ_0 is additionally estimated from this regression. Be aware that γ_0 and γ_1 vary between the different versions of the models because ν is also different. For the *b*-versions of the three models, we estimate β_1 from $ef_{t+1} = \beta_0 + \beta_1 \cdot ef_t + \varepsilon_{t+1}$. Again, ef_t is cg_t, hc_t or ic_t.

The book value growth parameter G in models *IIIa* and *IIIb* is estimated according to COP (2006) using book value data from year 2000 to 2005:

$$G = \frac{\sum_{t=2001}^{t=2005} \sum_{j=1}^{j=N} bv_{t,j}}{\sum_{t=2000}^{t=2004} \sum_{j=1}^{j=N} bv_{t,j}}$$

where N is the number of firms j in the sample and t is the respective year.[14] Thereby, we estimate a G of 1.033.

To mitigate the effect of outliers in the regressions for the above introduced linear information models, we omit the largest and smallest observation of each variable as in prior studies (e. g. McCrae and Nilsson (2001), who exclude the top and bottom 1%). To estimate the models we use the Euro benchmark bond interest rate as the risk free interest rate for year t and a uniform risk premium of 4%.[15] Using time-variant interest rates that do not vary across companies is a standard approach used by most studies in this strand of literature for calculating and discounting RI. As a consequence, the market portfolio return and the risk-free return move together. Henceforth, we name this discount rate constant as it is equal for all companies. Additionally, we use annually updated firm-specific discount rates to discount abnormal earnings with cross-sectional variations and use discount rates that vary across companies and time when calculating RI.[16] Therefore, the Capital Asset Pricing Model (CAPM) is used to calculate firm- and time-specific cost of capital. Betas are based on the slope of a regression of prior 48 monthly stock returns on the return of the EURO STOXX. We use simple returns on a monthly basis because we assume the returns to be normally distributed.[17] The market risk premium is set to 4%.

We estimate the market value of a firm on a per share basis.[18] Unfortunately, the use of per share values does not adequately control for the effects of scale because shares come in different sizes. As shown by Barth and Kallapur (1996), the deflation of firm level data by the number of shares does not eliminate the coefficient bias arising from the omission of a scale factor. Brown et al. (1999) allude to this as well.[19] For this reason, we additionally deflate all variables by the market value of equity per share as, for example, in Dechow et al. (1999), Gregory et al. (2005), and Pfeil (2003), in order to mitigate problems related to the scale effect.[20] Since we estimate the RI regression cross-sectionally, the deflation is especially important in our study. Dechow et al. (1999), McCrae and Nilsson (2001), and Gregory et al. (2005) all show that a first order autoregressive process is generally sufficient to capture the persistence of RI for their data samples of US, Swedish and UK firms. Due to data restrictions, we cannot test whether a one year time lag is sufficient for EFI to be reflected in RI. Before turning to the results, we want to underline that two possible data problems (firms following US-GAAP and selection bias) are addressed in the sensitivity analysis at the end of this section. We can confirm that the results presented here are not distorted.

Test of Linear Information Models

In the following section, we examine whether the parameters we estimate are in line with the theoretical values given by the above models. We address seven questions: (i) Is the autoregressive coefficient ω_1 for RI_t in the RI dynamics significantly different from the polar values zero and one? (ii) Is the intercept ω_0 significantly different from zero in the

RI dynamics? (iii) Is the RI dynamics, including EFI, more appropriate for explaining future RI? (iv) Are the parameters ω_2 for cg_t, hc_t, and ic_t significantly positive in the RI dynamics? (v) Are the autoregressive coefficients β_1 for cg_t, hc_t, and ic_t significantly different from the extreme values zero and one? (vi) Is the autoregressive coefficient γ_1 for the variable ν significantly different from the extreme values zero and one? (vii) Is γ_0 significantly different from zero?

Table 3 presents the parameter estimates for the different specifications of the RI equations. Parameters are estimated in cross-sectional ordinary least squares regressions. As can be seen from Panel A and B in table 3, ω_1 is significantly positive in all model specifications for both, constant and firm-specific discount rates. The parameter ω_1 for RI_t, estimated for the models *Ia-O*, *IIa-OA*, and *IIIa-COP* in Panel A can be compared to other studies. Our value obtained for constant discount rates (0.702) is slightly higher than the value obtained by Dechow et al. (1999) (0.62) and COP (2006) (0.490) for a sample of U.S. firms for the period from 1950-1995. This should be due to the short time window we analyse. Since ω_1 is in all equations smaller than one, it is in the expected range. The notion here is that a competitive advantage will persist for some time and competition will reduce the returns towards the cost of capital. In all RI regressions, ω_0 is statistically significantly different from zero.

The adjusted R^2 of 30.9% in panel A for the regression of models *Ia-O*, *IIa-OA*, and *IIIa-COP* is in the range of McCrae and Nilsson (2001), who present an adjusted R^2 of 29.3% or Dechow et al. (1999) who obtain 34% in the regression. As can be seen from Panel A and B of table 3, the adjusted R^2 is highest for the RI regression including HC information for both, constant (35.5%) and firm-specific discount rates (39.9%), but the adjusted R^2 is lower for regressions including CG and IC than for the regression without EFI. Further, the Akaike information criterion (not reported) is lowest - for constant and firm-specific discount rates - for the HC specification. However, the Schwarz criterion (not reported) is lowest for the regression without EFI. Nonetheless, the RI of the next period is well explained when the HC information is considered besides the RI of the current period. This cannot be claimed for CG or IC information.[21]

We observe a statistically significant positive influence of HC on the RI of the next period. The confirms our hypothesis that HC provides a competitive advantage having a positive impact on future RI. We do not observe a statistically significant influence of CG or IC on the RI of the next period. When combining the different kinds of EFI in multiple RI regressions, we also cannot find a significant influence of the two ratings (regressions not reported). For this reason, we expect that CG and IC cannot contribute to explain current stock prices more accurately or to predict future stock returns.

The parameters β_1 for the evolution of EFI, as shown in the autoregressions of panel C of table 3, are significantly different from zero for CG and IC. The relatively high values for CG and IC (0.618 and 0.866) indicate that next year EFI is well explained by the EFI of the current year. The relatively low value for β_1 of 0.203 for HC in combination with a low adjusted R^2 indicates that the information about HC is transitory and also that this rating comprises additional new information in the next period. β_1 is between zero and one and thus within the expected range for all EFI. In panel D of table 3, the change of ν_t is estimated by the parameter γ_1. ν_t is computed as $\nu_t = f_t^a - \omega_1 \cdot RI_t$ for model type *II* and as $\nu_t = f_t^a - (\omega_0 \cdot bv_t + \omega_1 \cdot RI_t)$ for model type *III*.[22] As can be seen from panel D, the parameter γ_1 is neither for constant nor for firm-specific discount rates statistically significant. This does not hold prior research and is presumably attributable to the lack of time series data. However, γ_0 is always statistically significantly different from zero, indicating that the parameter should be considered in a valuation model as done by COP (2006). Concerning the first research question, we find RI_{t+1} is well explained by a model including RI_t and hc_t. CG and IC do not contribute to explain RI_{t+1}. The influence of the HC information is significantly positive.

[Insert table 3 about here]

Explanation of Current Stock Prices

The second research question focuses on the ability of the different model specifications to explain current stock prices. Therefore, we calculate the fundamental values per shares (V) as described in the above linear information models. We compare V at the last day of fiscal year 2005 with the share price (P) at the last trading day of the month ending six months after the end of the fiscal year.[23] Based on this, we determine valuation errors as done, for example, by Dechow et al. (1999). We calculate mean valuation errors as well as mean absolute and squared valuation errors based on V and P. Further, we test whether V is correlated with market value in the cross-section: $\text{Corr}(V,P) > 0$. We calculate Pearson as well as Spearman correlation coefficients in order to better compare our results to prior research. The higher the correlation coefficients, the better a model is able to explain market value.

The mean valuation errors for the year 2005 are presented in table 4. The valuation errors are calculated as:

$$VE = \frac{P - V}{P},$$

where P is a firm's stock price six months after the end of the fiscal year 2005 and V is the estimated fundamental value for 2005. The absolute valuation error is $AVE = |VE|$ and the squared valuation error is $SQVE = (VE)^2$. AVE ensures that positive and negative valuation errors are not subtracted and SQVE additionally gives more weight to valuation errors that are larger in absolute values.

[Insert table 4 about here]

As can be seen from table 4, the models *I* and *II* have a mean positive VE showing that they underestimate the stock price on average. This is in keeping with almost all prior studies (an exception is the inflation adjusted model of Gregory et al. (2005)). The model type *III* based on COP (2006) overestimates the stock price as indicated by the negative mean valuation errors. All the values for VE are quite large in absolute values compared to other studies such as Dechow et al. (1999) or McCrae and Nilsson (2001). McCrae and Nilsson, for example, report a VE of 0.34 for the Ohlson (1995) model not including "other information" that is equivalent to model *Ia*.

Our results concerning AVE and SQVE are comparable to Dechow et al. (1999) and Gregory et al. (2005) for models *I* and *II*. McCrae and Nilsson (2001) report an AVE of 0.49 and an SQVE of 0.33 on average in a model comparable to our model *Ia-O* for their sample of Swedish companies for the years 1970-1997. Like COP (2006), we observe a larger AVE for *IIIa-COP* than for *IIa-OA*. In our case, the AVE in model *IIIa-COP* is tremendously higher than the AVE of model IIa (AVE for constant discount rates: *IIIa-COP* = 0.617; *IIa-OA* = 0.425). In COP (2006), it rises from 0.453 to only 0.484. Since the valuation errors are even more extreme for the different specifications of *IIIb*, model types *I* and *II* do a better job in explaining market values although we do not observe an undervaluation problem for model type *III*.

Focusing on model type *I*, we find that *Ib-OHC* is dominating the other three versions of the model in explaining current stock prices for constant and firm-specific discount rates. For model *II*, *IIb-OAHC* is best and for model *III*, *IIIa-COP* dominates the other specifications for both discount rate specifications. Comparing the three models with each other, we find that valuation errors are smallest for model type *II*. Thus, a combination of analysts' forecasts and HC information seems to be most appropriate for explaining current stock prices.

Next, we examine the correlation between the stock prices P and the intrinsic values V calculated by the models. Table 5 presents the Pearson and the Spearman correlation coefficients for constant and firm-specific discount rates. The correlation coefficients are highest for model *IIb-OAHC*. This again indicates that combining analysts' forecasts with HC information is an appropriate model for explaining the current price. The correlation coefficients are quite high in general. McCrae and Nilsson (2001) report an average Spearman correlation coefficient of 0.70 over the years 1970-1997 for the Ohlson model not including "other information", and 0.74 for a model incorporating analysts' forecasts.

[Insert table 5 about here]

Generally, our evidence indicates that model *IIb-OAHC* is best suited for explaining stock prices. Using a nonparametric signed rank test, we also test the null hypothesis that the median of VE is zero for the different models. We reject the null hypothesis at the 1 percent level for all models. We can observe an undervaluation problem for models *I* and *II* and a severe overvaluation problem for model type *III*. As argued by Henschke et al. (2007: 4), the failure of model type *III* to reduce inaccuracy for the whole sample might be "the consequence of forcing the model to value firms with different degrees of conservatism on the basis of the same conservatism coefficient". They find that valuation inaccuracy is markedly reduced when LIM parameters are estimated separately according to market to book deciles. Gassen et al. (2006) investigate the interaction of conditional conservatism with unconditional conservatism and income smoothing for 23 developed equity markets over the time period 1990-2003. Gassen et al. (2006: 557) find that "differences in income smoothing are sufficient to explain the different levels of conditional conservatism between legal regimes." Further, the accounting quality in terms of the accrual persistence, the estimation error in the accrual process and earnings management as described by Givoly et al. (2008), is likely to vary between different countries. Soderstrom and Sun (2007: 675) argue that "cross-country differences in accounting quality are likely to remain following IFRS adoption" in the EU. This is due to the "overall institutional setting, including the legal and political system of the countries in which the firm" reside. However, we cannot control for differences in accounting quality due to a small sample size combined with a short time period. Also in line with Henschke et al. (2007), we observe that fundamental values V of model type *III* are very sensitive to the difference between the growth of book value G-1 and the discount rate r. Since firm-specific discount rates are often close to G minus 1, we observe that stock prices are poorly explained by model *III* when it is implemented with firm-specific discount rates. Next, we test whether the models are useful in predicting stock returns.

Prediction of Stock Performance

If the models incorporate relevant information that is not reflected by share prices six months after the end of the fiscal year, we can expect that the models are suitable for identifying under- and overvalued companies. Thus, we analyse whether the values implied by the valuation models are able to predict future stock performance. Following Dechow et al. (1999), Frankel and Lee (1998), and McCrae and Nilsson (2001), we conduct a portfolio approach. Stocks are sorted into ten portfolios based on the V/P ratios six months after the end of the fiscal year 2005. Lower deciles consist of stocks that are overpriced relative to the fundamental value and higher deciles consist of underpriced stocks.[24] Overpriced stocks are expected to yield lower future returns than underpriced stocks. The portfolios are formed on the last trading day of June in 2006 and the performance of each portfolio is observed over the next twelve months.[25] Since all information used is available at the end of June 2006 this is a tradable strategy. Table 6 presents the portfolio decile results for constant and firm-specific discount rates as well as the hedge portfolio return defined as the difference in return between firms in the highest and lowest decile portfolios (P10 - P1).

[Insert table 6 about here]

The highest hedge return is generated by model *Ib-OHC*. It is the only model for which the median stock return of P10 is significantly higher than for P1 when using both, constant and firm-specific discount rates. A positive hedge return is generated by all models except for *IIIa-COP* and *IIIb-COPHC* when implemented with firm-specific discount rates. This means investors would have earned money by short-selling shares in the P1 portfolio and buying shares of the P10 portfolio in all but these two specifications. In line with prior studies, we find that the average return is not steadily increasing from P1 to P10 for the different models.

Like Dechow et al. (1999), we find for models *I* and *II* that incorporating analysts' forecasts increases the models' ability to explain contemporaneous stock prices whereas models ignoring this information tend to be better predictors of future stock returns. McCrae and Nilsson (2001), do not find significant differences between the most extreme portfolios for eleven yearly portfolio returns for models equivalent to *Ia* and *IIa*.

However, in contrast with our findings and Dechow et al. (1999), McCrae and Nilsson (2001) find that model *IIa* tends to be better in predicting stock returns than *Ia.*

Since the portfolio analysis above does not capture different risk characteristics of the stocks, we also test whether the median reward-to-variability ratio developed by Sharpe (1966), is higher for P10 portfolios compared to P1 portfolios for the one year time period starting at the end of June 2006. The Sharpe Ratio (SR) is calculated according to

$$SR = \frac{r_s - r_f}{\sigma}$$

where r_s is the return of a share, r_f is the risk free return, and σ is the volatility of the share returns.[26] r_s is the one year buy-and-hold stock return, r_f is proxied by the one year German treasury bond rate (since an adequate one year European bond rate is not available) that is 3.15% at the end of June 2006, and σ is calculated using 60 monthly returns starting in July 2002. As can be seen from table 7, model *Ib-OHC* is the only model for which the median SR of P10 is statistically significantly higher than the median SR of P1 for both, constant and firm-specific discount rates. This confirms that model *Ib-OHC*, which is based on the Ohlson (1995) model and includes HC information but no analysts' forecasts, is suited for identifying under- and overvalued companies. The median SR is higher for P10 portfolios than for P1 portfolios for all our valuation models.

[Insert table 7 about here]

For the observed time period, model *IIb-OAHC* is best in explaining market values and model *Ib-OHC* is best in identifying under- and overvalued companies and thus for predicting one period ahead stock returns and risk adjusted stock performance. This indicates that the HC information includes information beyond fundamental accounting information and analysts' forecasts. We do not find evidence that CG or IC do systematically improve or worsen models' ability to explain the current stock prices or to predict future stock returns. This is not surprising as both types of EFI do not contribute to explain future RI, as shown above. Model type *II*, including analysts' forecasts seems most appropriate for explaining current stock prices. This indicates that analysts' forecasts are reflected in prices after a short period of time. Whereas for investors who want to generate abnormal returns in the year after all necessary information is available to the market, it is useful to base the investment decision on model *Ib-OHC* including HC information but no analysts' forecasts. Further, we find that model I is better in identifying under- and overvalued companies and model II is better in explaining current stock prices when the models are implemented with firm-specific discount rates instead of constant discount rates. In the next section, we will analyse the robustness of our results.

Sensitivity Analysis

This section summarizes the findings for sensitivity tests conducted to evaluate the robustness of the above results.

We identify two possible concerns related to our study. First, we have nine companies implementing US-GAAP in our sample. Second, we see the possibility of selection bias arising by the exclusion procedure of firms which is described in section 4. To control for the first problem, we implemented several regressions with US-GAAP and interaction dummies. Since these dummies are not statistically significant at any usual significance level and the estimated parameters are not materially changed, we report the study without these dummy-variables. Due to converging tendencies of IFRS and US-GAAP, it is comprehensible that there is not a significant difference in our results based on the accounting standard.

We address the problem of a potential selection bias by implementing the two-stage model of Heckman (1979). We assume the reader is familiar with this model. For an introduction, see Wooldridge (2002: 562-6) or Li and Prabhala (2007). Since the Inverse Mills Ratio (IMR), is never statistically significant at any usual significance level in the regressions of the second step, the null of no selection bias cannot be rejected. In this section, we briefly outline the basic results of the two-stage model. In the first step, a probit model is used to estimate the likelihood for the largest 150 EURO STOXX companies (without financial companies) to be included in the sample:

$$\mathrm{ins}_j = \delta_0 + \delta_1 \cdot \log(\mathrm{mvff}_j) + \delta_2 \cdot \mathrm{US\_GAAP}_j + \delta_3 \cdot \mathrm{local\_GAAP}_j .$$

The variable ins_j is coded 1, if a firm j is in the sample and zero otherwise. $\log(\mathrm{mvff}_j)$ is the natural logarithm of the free float market value (divided by 1.000.000) at the end of the year 2004. The variables $\mathrm{US\_GAAP}_j$ and $\mathrm{local\_GAAP}_j$ denote the accounting standard followed in the year 2004. We refrain from including country or industry dummies in the probit regression due to multicollinearity problems. The results from estimating the probit model are depicted in table 8. The highly significant positive coefficient of $\log(\mathrm{mvff}_j)$ indicates that a firm with a larger free float market capitalization is more likely included in the sample. This is appealing since the reporting quality of larger companies is assumed to be better. The positive coefficient concerning the US-GAAP dummy is explained by the fact that these companies usually do not switch the accounting standard followed during the period of interest. Some firms are excluded from the sample because they switch from local GAAP in 2004 to IFRS in 2005 and do not report restated accounting data for 2004.

[Insert table 8 about here]

In the second stage, we include the IMR calculated from the results of the first stage in all ordinary least squares regressions needed to calculate the above presented linear information models. These are all the regressions shown in table 3. We do not present the results for the regressions because the estimated parameters do not materially deviate from the parameters shown in table 3 and IMR is never statistically significant. As a consequence, the results concerning the models' ability to explain current stock prices and the models' ability to identify under- and overvalued companies yield the same conclusions when accounting for the selection bias. We also test for possible interactions between sample selection bias and the applied accounting standards, but again, the results are not materially different from the results shown above.

As stated before, models *IIIa* and *IIIb* seem very sensitive to the spread between G and the discount rate r. For this reason, we conduct a sensitivity analysis with values for G = 1.00, 1.01, 1.02, 1.03, 1.04, and 1.05 and the constant discount rate r that is 7.39% in 2005. We observe that the average valuation error is negative with respect to all values of G for the different model specifications. Thus, on average, estimated values are higher than prices. With increasing G and thereby a decreasing spread between G minus one and the discount rate, the average valuation errors become more negative. Average AVE and SQVE increase with a higher G. SQVE is never smaller for model type *III* than for model *IIb-OAHC*. However, AVE is smaller in all specifications of model *III* for a G of 1.00. For a G larger than 1.01, AVE is always smaller than for model *IIb-OAHC*. Thus, for empirically reasonable values of G, model *IIb-OAHC* better explains market values. The decile portfolios for model type *III* remain relatively stable with respect to G. P10 - P1 always yields a hedge portfolio return of 31.9% or 26.7%. The difference between the medians of the Sharpe Ratio for P10 and P1 is never statistically significant for any model type *III*. The results for firm-specific discount rates are similar as for constant discount rates. When implementing this analysis with firm-specific discount rates, some firms have to be excluded as the terminal value condition, i. e. G-1 < r, is violated.

Although we are convinced that market value deflation is appropriate to mitigate a scale effect in the regressions, we additionally deflate by book value of equity. This follows the argument of COP that price-scaled data will cause prior prices to appear as an information variable in models *IIIa* and *IIIb*, if the ω_0 or γ_0 parameters are not zero. We obtain an adjusted R^2 of more than 50% for the regression $RI_{t+1} = \omega_0 + \omega_1 \cdot RI_t + \varepsilon_{t+1}$ and for the CG, HC, and IC specifications of $RI_{t+1} = \omega_0 + \omega_1 \cdot RI_t + \omega_2 \cdot ef_t + \varepsilon_{t+1}$ when scaling by book value of year t. We address this increase relative to market value deflation to the scale effect. The influence of scale is especially intensive in our study since we run cross-sectional regressions. In all regressions, ω_1 is close to one which is the models' theoretical polar value, which contradicts prior empirical research. When implementing models *IIIa* and *IIIb* with book value scaled data, we obtain more negative average valuation errors. This can be explained by the high ω_1 values in combination with predominantly positive RI in our sample. So, on average, companies are even more overvalued by models *IIIa* and *IIIb* when the regressions are book value scaled.

Due to poor public availability of extra-financial information before 2004, we do not calculate ω_0, ω_1, and ω_2 from the regression $RI_{t+1} = \omega_0 + \omega_1 \cdot RI_t + \omega_2 \cdot ef_t + \varepsilon_{t+1}$ based on 2003 and 2004 data. Consequently, we cannot calculate ν_{2004} for models *IIb* and *IIIb* necessary to calculate the gamma parameters. As described earlier, we implement the specifications of model type *IIb* with the γ_1 value of *IIa* and LIM *IIIb* with the values for γ_0 and γ_1 from LIM *IIIa*. Here, we test the sensitivity of model *IIb-OAHC* with respect to the parameter γ_1: The question is whether the result that *IIb-OAHC* is best in explaining market values is subject to an γ_1 value that is not empirically observed. For this reason, we implement model *IIb-OAHC* for all theoretically possible values: $0 \leq \gamma_1 \leq 1$. We find that our results are not sensitive to γ_1. Implemented with constant discount rates, *IIb-OAHC* is best in explaining market prices in terms of the different kinds of mean valuation errors and the Pearson correlation for γ_1 values between zero and 0.876. When implemented with firm-specific discount rates, *IIb-OAHC* is best for γ_1 values between zero and 0.837. Since a γ_1 value larger than 0.837 is empirically very unlikely, it is robust to say that *IIb-OAHC* best explains market prices.

6. Conclusions, Limitations, and Perspectives

This paper tests whether extra-financial information, that is, corporate governance, human capital, and innovation capital information, offers additional insights in explaining current stock prices and future stock returns for a sample of large EURO STOXX companies. For this purpose, we implement six different versions of the residual income valuation model based on Ohlson (1995) and COP (2006).

We find that human capital information is useful in a model with linear information dynamics for explaining the residual income of the next period. Further, a company's human capital quality positively influences the residual income of the next period, which we interpret as a source of competitive advantage. Including analysts' forecasts improves the models' accuracy in explaining current stock prices. However, it does not systematically improve the models' predictive power. These findings are in keeping with prior research. Concerning the models' predictive strength, we find that a model including human capital information and no analysts' forecasts is best in identifying under- and overvalued companies and thus in predicting future stock performance. This indicates that the human capital rating has relevant information content beyond analysts' forecasts and accounting figures. This creates a noteworthy investment opportunity for investors. However, we do not find that corporate governance or innovation capital information enhance the models' explanatory or predictive abilities. For our sample, we observe that models based on COP (2006) overcome the problem of undervaluation by considering conservative accounting. However, consistent with the findings of COP (2006), valuation accuracy is not improved with these models and the intrinsic value estimates generated by the models are highly volatile with respect to the growth rate of the book value.

Our empirical study is subject to some important limitations. First, our findings are necessarily based on a small data sample consisting of companies with high free float market capitalization due to a limited EFI reporting activity of small and medium sized companies. For this reason, our results need not hold for smaller companies. Second, we are only able to analyze a short period of time and thus cannot determine whether our results are robust over time. Since smaller companies are on the verge of reporting more extra-financial information, these two constraints can be overcome by future research when longer time series will be available for extra-financial information. A third limitation is that we cannot consider different degrees of accounting quality in our research. Estimation procedures as proposed by Henschke et al. (2007) cannot be implemented due to a small sample size combined with a short time period. Finally, we assume a one year time lag to be appropriate for EFI to be reflected in the residual income. We do not test longer lags due to data limitations. We cannot dismiss the possibility that major benefits of CG, HC, and IC take longer to materialize than one year's time (see e. g. Chan et al. (2001) for R&D). However, as can be seen from the autoregressions of panel C in table 3, EFI - although eroding - is present in future periods, too. Thus, EFI also has an impact on future RI. Figures 1a and 1b illustrate how future expected RI differ from the basic models when EFI is additionally considered.

The future of this research holds great promise in our opinion. More and more firms are beginning to provide extensive information on HC and other extra-financial information in their reports as they acknowledge its usefulness for investors and other stakeholders. Our research contributes in rendering a first assessment of its value impact.

[1] Many studies that are in the spirit of Ohlson (1995) and Feltham and Ohlson (1995) do not explicitly incorporate linear information models. Among these are Frankel and Lee (1998), for example.

[2] Myers (1999) also incorporates information (order backlog) in the LIM that is not yet reflected by accounting figures. Hence, our models including EFI are in the spirit of Myers (1999).

[3] For more information concerning the Ohlson model, we refer to Ohlson (1995) and the Lundholm (1995) tutorial.

[4] For notational simplicity, we refrain in the following from writing an expectation operator when a variable is in the future of year t.

[5] One might be inclined to implement a full model with all three rating variables simultaneously. However, as our empirical findings show, this does not convey any new information.

[6] It must be emphasized that the market's earnings expectations are not directly observable. Thus, analysts' consensus earnings forecasts are only a proxy for the market's earnings expectations. We do not follow approaches that correct analysts' forecasts for estimation bias based on observable prior forecast errors. It is questionable whether rational forecasts can be obtained through mechanistic adjustments of analysts' forecasts given that forecast errors are highly skewed empirically. Abarbanell and Lehavy (2003) demonstrate how widely held beliefs about systematic errors in analysts' forecasts are not supported by their analysis of the distribution of forecast errors: perhaps the most prominent belief is that analysts generally produce optimistic forecasts.

[7] See Dechow et al. (1999), Myers (1999), and Callen and Segal (2005).

[8] Choi, O'Hanlon and Pope (2006) argue that, under reasonable assumptions, the coefficient must be negative when the mean residual income is negative during an empirical estimation using pooled cross-section and time-series data. We also see an additional explanation for the negative coefficient when it is estimated from this regression: $RI_{t+1} = \omega_{10} + \omega_{11} \cdot RI_t + \omega_{12} \cdot bv_t + \varepsilon_{1t+1}$. Although the model implies that some

residual income should stem from conservative accounting and thus ω_{12} should be positive, in a cross-sectional regression ω_{12} can be negative. We argue that accounting conservatism varies between companies. We compare two identical companies A and B with only one distinction: Firm A has a higher degree of accounting conservatism than firm B. This means that bv_t is smaller for firm A. As a consequence, RI_{t+1} is smaller for firm B since both companies have the same amount of earnings. Taking this effect into account, in a cross-sectional regression a negative ω_{12} is explainable.

9 The Value Group is a Germany-based developer of financial products that uses its research about non-financial information in addition to the financial analysis as a basis for investment decisions. See http://www.thevaluegroup.de.

10 Isidro et al. (2006) examine empirically the valuation errors arising from violations of the clean surplus relationship in a residual income valuation framework for France, Germany, UK and the US. Except for the US, the study finds little evidence for such a relationship.

11 This is possible because when switching to IFRS, companies publish the statement of changes in equity under the new accounting standard for the last two years.

12 The equity cost of capital is based on the Euro benchmark bond interest rate of year t plus a general 4% risk premium. Working with firm-specific equity cost of capital based on the CAPM yields similar RI.

13 The respective extra-financial rating score with potential values from 0-10 is centred by subtracting the mean rating score of all companies from the actual value of a firm. Thus, a positive extra-financial rating indicates a competitive advantage in relation to the average firm.

14 Beginning with the year 2000 ensures book value data to be available for all companies in the sample. COP (2006) employ a longer history because they do not demand that book value data are available for the whole sample in all years. We correct for firm years with switches in accounting standards.

15 McCrae and Nilsson (2001) set the risk premium to 4% for Swedish companies. Diakité (2005) also sets the risk premium to 4% for the valuation of a French

telecommunication firm. His estimate is based on prior studies considering historical, implied and survey premia.

16 This approach follows the argument that it is more precise to adopt company-specific discount rates than to work with aggregate constant discount rates. See Beaver (1999), for example.

17 See Fama (1976: 30-5).

18 Ohlson (2000) shows that on a per share basis clean surplus will not generally hold if there are expected changes in shares outstanding. This would be a necessity for the residual income valuation formula to be valid. However, he also shows that a total equity approach does not work for firms planning to bring in new shareholders who derive a net benefit from their capital contributions. As there is no easy solution to this problem and to maintain consistency with prior studies we estimate the market value on a per share basis (see, for example, Dechow et al. (1999) or COP (2006)).

19 If a share with a high market price is added to a sample of shares with low market prices, this share will likely have a relatively high positive or negative value for RI in both periods compared to the other shares in a RI regression where RI_{t+1} is the dependent and RI_t the independent variable. Recalling the ordinary least squares optimization, it is likely that this will result in biased estimates.

20 Since COP (2006: 99) argue that the "use of price-scaled data will cause price to appear as an information variable in the associated valuation model, if the ω_0 and/or γ_0 parameters are not zero", we also scale by book value in the sensitivity analysis section.

21 EFI can also influence the equity costs of capital (see Ashbaugh et al. (2004) for CG). We do not explicitly consider this effect in our models, as we use the standard CAPM to determine firm-specific discount rates.

22 Since the quality of the extra-financial information before 2004 is objectionable, we do not calculate ω_0, ω_1, and ω_2 from the regression $RI_{t+1} = \omega_0 + \omega_1 \cdot RI_t + \omega_2 \cdot ef_t + \varepsilon_{t+1}$ based on 2003 and 2004 data. As a consequence, we cannot calculate ν_{2004} for models *IIb* and *IIIb* necessary to calculate the gamma parameters. For this reason, we implement the

specifications of model type *IIb* with the γ_1 value of *IIa* and LIM *IIIb* with the values for γ_0 and γ_1 from LIM *IIIa*.

23 Corrections are made when dividend payments occur within the six months after fiscal year end. When the fiscal year ends at 2005-12-31, P is taken from the last trading day of June 2006, for example.

24 Be aware that stocks with a V/P ratio lower (higher) than one can be in high (low) percentile when a model generally yields low (high) intrinsic values in relation to stock prices.

25 We chose to start with our analysis at the end of June for all companies including Infineon, Siemens, and ThyssenKrupp although the end of the fiscal year of the three companies is in September. We do this in order to assure that hedge portfolios could be generated by an investor. We do not see a problem starting to measure performance nine months after the end of the fiscal year since none of the three companies is attributed to P1 or P10 by the V/P ratio measured six months after the end of the fiscal year.

26 For a discussion of the SR assumptions, see Shukla and Trzcinka (1992), for example. We do acknowledge empirical problems related to the SR when $r_s - r_f$ is negative. Since there are only two negative excess returns in our sample, we do not see a systematic problem here.

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APPENDIX

FIGURE 1A

Forecast of Expected Residual Income per Share for Saint Gobain:
Models I and II with Firm-Specific Discount Rate

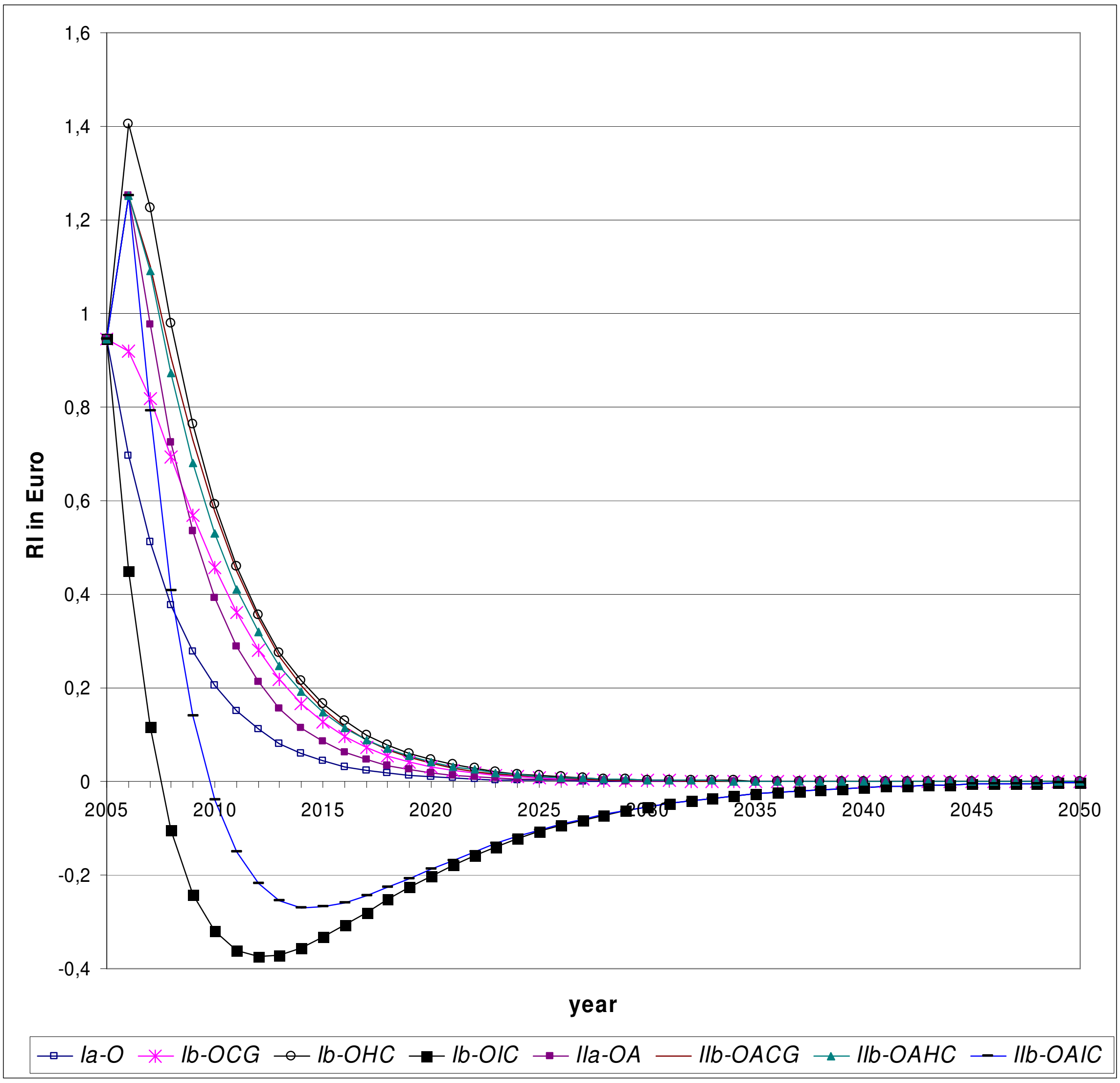
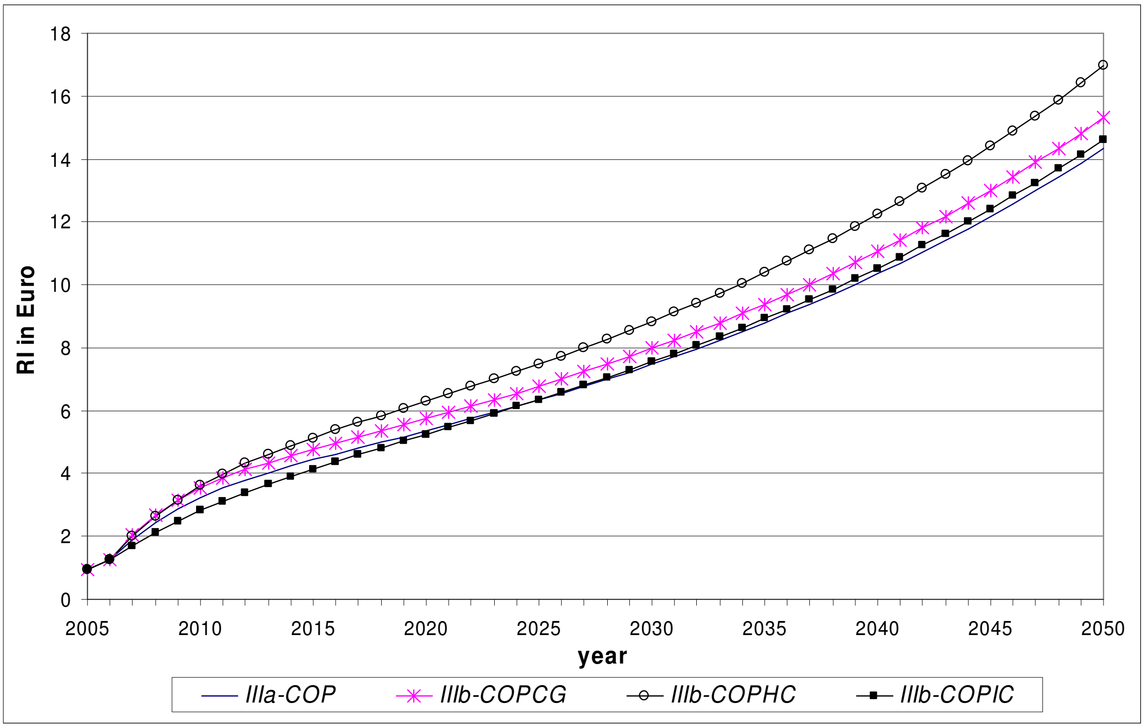


FIGURE 1B

Forecast of Expected Residual Income per Share for Saint Gobain:

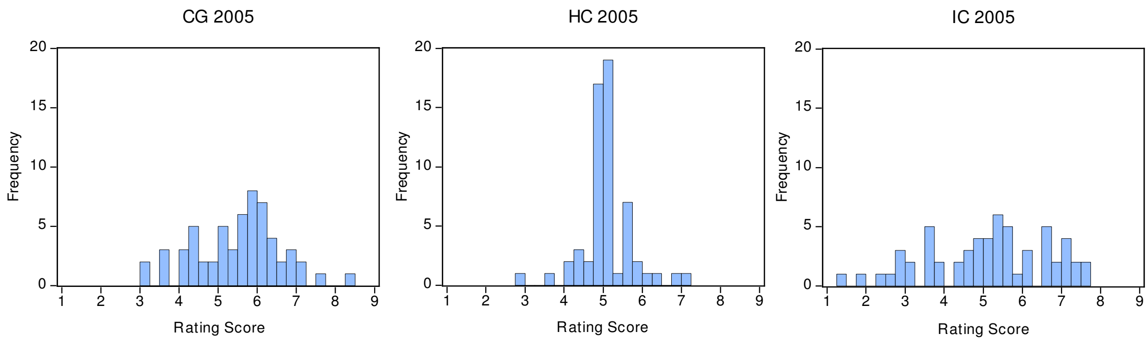
Model III with Firm-Specific Discount Rate



Notes:
Evolution of expected RI per share for the company Saint Gobain based on the following parameters (in Euro): $bv_{2005} = 36.41$, $RI_{2005} = 0.95$, and $r_{2005} = 8.68\%$; ef is (centred EFI ratings multiplied with the value added): $cg_{2005} = -23.60$, $hc_{2005} = 15.55$, and $ic_{2005} = 64.67$. Since the RI for the year 2005 (valuation date) is known, all models start with the same RI. Models *II* and *III* generate an equal RI in t = 2 (year 2006), too, since RI is defined as $f_t^a = f_t - r \cdot bv_t$ where f_t is the consensus analysts' forecast of earnings for year t+1. The RI for models *I* and *II* is mean reverting. This does not hold for model type *III*. This is due to the term $\omega_0 \cdot bv_t$ in the residual income dynamics (9) and the term $\gamma_0 \cdot bv_t$ in equation (11). Hence, the long run expected RI of Saint Gobain exceeds zero, taking into consideration that accounting is conservative. Depending on the respective parameters, the RI in model type *III* tends to either increase or decrease over time. When implemented with constant discount rates, we observe similar patterns of residual income evolution. Abbreviations for the different models are explained in the notes to table 3.

FIGURE 2

Histograms for Extra-Financial Ratings of the Year 2005



Notes:
Histograms show the frequency of rating values (not centred) for the year 2005. The theoretical range for rating values is from 0 to 10 with 10 as best rating score.

TABLE 1

Pearson Correlations for Extra-Financial Ratings

	CG 2004	**CG 2005**	**HC 2004**	**HC 2005**	**IC 2004**
CG 2005	0.776				
	(0.000)***				
HC 2004	-0.111	-0.117			
	(0.401)	(0.377)			
HC 2005	-0.123	-0.143	0.188		
	(0.352)	(0.280)	(0.154)		
IC 2004	0.132	0.178	0.129	0.015	
	(0.318)	(0.176)	(0.328)	(0.913)	
IC 2005	0.151	0.243	0.036	-0.024	0.769
	(0.253)	(0.063)*	(0.786)	(0.855)	(0.000)***

Notes:
The p-values for testing the statistical significance of the correlations are in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

TABLE 2

Financial Data

	year	Percentile 20th	40th	50th	60th	80th
Book-to-price ratio	2004	0.321	0.424	0.514	0.61	0.763
	2005	0.313	0.424	0.486	0.513	0.751
Earnings-to-price ratio	2004	0.045	0.058	0.065	0.074	0.105
	2005	0.044	0.064	0.066	0.072	0.091
Return-on-equity	2004	0.099	0.138	0.144	0.165	0.232
	2005	0.106	0.146	0.172	0.201	0.274
Residual income	2004	0.007	0.027	0.033	0.039	0.073
	2005	0.017	0.031	0.037	0.046	0.071

Notes:
Table 2 shows percentiles for key financial variables for the years 2004 and 2005. Book-to-price ratio is defined as book value of equity divided by the market value of equity at the last trading day of the fiscal year. Book value is book value of common shareholders' equity at the end of the fiscal year. Earnings-to-price ratio is the net income available to common divided by the market value of equity at the last trading day of the fiscal year. Return-on-equity is defined as net income divided by last fiscal year's book value. RI is net income minus the discount rate times the book value of equity at the end of the previous fiscal year. It is deflated by the market value at the end of the previous fiscal year. The book value in 2003 and all accounting variables for the year 2004 are restated for every firm switching to IFRS.

TABLE 3

Estimation Results of the Model Parameters

Panel A: Residual Income Regressions with Constant Discount Rate

		Regressions used for models			
		Ia-O	*Ib-OCG*	*Ib-OHC*	*Ib-OIC*
	Exp.	*IIa-OA*	*IIb-OACG*	*IIb-OAHC*	*IIb-OAIC*
Variable	Sign	*IIIa-COP*	*IIIb-COPCG*	*IIIb-COPHC*	*IIIb-COPIC*
Intercept (ω_0)	+/-	0.0172	0.0184	0.0177	0.0171
		(0.009)***	(0.013)**	(0.006)***	(0.014)**
RI_t (ω_1)	+	0.7015	0.6999	0.7471	0.7076
		(0.000)***	(0.000)***	(0.000)***	(0.000)***
cg_t (ω_2)	+		-0.0087		
			(0.360)		
hc_t (ω_2)	+			0.0437	
				(0.035)**	
ic_t (ω_2)	+				-0.0019
					(0.832)
Adjusted R^2		30.86%	22.50%	35.45%	29.51%

TABLE 3 (continued)

Estimation Results of the Model Parameters

Panel B: Residual Income Regressions with Firm-Specific Discount Rate

Variable	Exp. Sign	*Ia-O* *IIa-OA* *IIIa-COP*	*Ib-OCG* *IIb-OACG* *IIIb-COPCG*	*Ib-OHC* *IIb-OAHC* *IIIb-COPHC*	*Ib-OIC* *IIb-OAIC* *IIIb-COPIC*
		Regressions used for models			
Intercept (ω_0)	+/-	0.0162 (0.011)**	0.0169 (0.018)**	0.0169 (0.007)***	0.0161 (0.016)**
RI_t (ω_1)	+	0.7357 (0.000)***	0.7475 (0.000)***	0.7752 (0.000)***	0.7425 (0.000)***
cg_t (ω_2)	+		-0.0090 (0.342)		
hc_t (ω_2)	+			0.0432 (0.037)**	
ic_t (ω_2)	+				-0.0039 (0.654)
Adjusted R^2		35.87%	28.56%	39.94%	34.78%

Panel C: Extra-Financial Autoregressions

$cg_{t+1} = \beta_0 + \beta_1 \cdot cg_t + \varepsilon_{t+1}$	(*Ib-OCG*, *IIb-OACG*, *IIIb-COPCG*)	
β_0: -0.0552 (0.207)	β_1: 0.6182 (0.000)***	Adj. R^2 52.94%
$hc_{t+1} = \beta_0 + \beta_1 \cdot hc_t + \varepsilon_{t+1}$	(*Ib-OHC*, *IIb-OAHC*, *IIIb-COPHC*)	
β_0: 0.0196 (0.504)	β_1: 0.2031 (0.121)	Adj. R^2 2.68%
$ic_{t+1} = \beta_0 + \beta_1 \cdot ic_t + \varepsilon_{t+1}$	(*Ib-OIC*, *IIb-OAIC*, *IIIb-COPIC*)	
β_0: 0.0228 (0.660)	β_1: 0.8661 (0.000)***	Adj. R^2 62.94%

TABLE 3 (continued)

Estimation Results of the Model Parameters

Panel D: "Other Information" Autoregressions

For constant discount rates:

$\nu_{t+1} = \gamma_0 + \gamma_1 \cdot \nu_t + \varepsilon_{t+1}$	(*IIa-OA*, *IIb-OACG*, *-OAHC*, *-OAIC*)	
γ_0 : 0.0184	γ_1 : 0.1039	Adj. R^2
(0.000)***	(0.414)	0.00%
$\nu_{t+1} = \gamma_0 + \gamma_1 \cdot \nu_t + \varepsilon_{t+1}$	(*IIIa-COP*, *IIIb-COPCG*, *-COPHC*, *-COPIC*)	
γ_0 : 0.0096	γ_1 : 0.1292	Adj. R^2
(0.007)***	(0.253)	0.61%

For firm-specific discount rates:

$\nu_{t+1} = \gamma_0 + \gamma_1 \cdot \nu_t + \varepsilon_{t+1}$	(*IIa-OA*, *IIb-OACG*, *-OAHC*, *-OAIC*)	
γ_0 : 0.0183	γ_1 : 0.1021	Adj. R^2
(0.000)***	(0.430)	0.00%
$\nu_{t+1} = \gamma_0 + \gamma_1 \cdot \nu_t + \varepsilon_{t+1}$	(*IIIa-COP*, *IIb-COPCG*, *-COPHC*, *-COPIC*)	
γ_0 : 0.0099	γ_1 : 0.1169	Adj. R^2
(0.007)***	(0.287)	0.29%

Notes:

The equations are estimated using cross-sectional ordinary least squares regressions for the data in the period 2004 and 2005. To reduce the influence of scale effects, all variables are deflated by the market value of equity at the end of the fiscal year t. To reduce the effect of outliers, the largest and smallest observation of each variable were omitted. Figures in parentheses are p-values based on t-statistics. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. Model type *I* is based on Ohlson (1995) but does not consider analysts' earnings forecasts: *Ia-O* is the model without EFI. *Ib-OCG*, *Ib-OHC*, and *Ib-OIC* are similar to *Ia-O*, however, they additionally include CG, HC, and IC information, respectively. Model type *II* is also based on Ohlson (1995) but includes "other information" ν_t : *IIa-OA* is without EFI and *IIb-OACG*, *IIb-OAHC*, and *IIb-OAIC* are similar to *IIa-OA* but additionally include CG, HC, and IC information, respectively. Model type *III* based on COP (2006) includes analysts' earnings forecasts and considers conservative accounting: *IIIa-COP* is the basic model whereas *IIIb-COPCG*, *IIIb-COPHC*, and *IIIb-COPIC* in addition include CG, HC, and IC information, respectively.

Panel A and B: The dependent variable is RI_{t+1} in all regressions. RI for year t is defined as $RI_t = x_t - r \cdot bv_{t-1}$ where x_t denotes net income available to common for year t, r is the discount rate, and bv_{t-1} is the book value of shareholders' equity at time t-1.

Panel A, B and C: In order to transform the extra-financial ratings in monetary variables, we multiply the ratings with the value added of year t. Thus cg_t, for example, is the centred corporate governance rating score of year t multiplied with the value added of year t.

Panel D: The "other information" variable ν_t is computed as $\nu_t = E_t[RI_{t+1}] - \omega_1 \cdot RI_t$ for model type *II* and as $\nu_t = E_t[RI_{t+1}] - (\omega_0 \cdot bv_t + \omega_1 \cdot RI_t)$ for model type *III* where $E_t[RI_{t+1}] = f_t^a = f_t - r \cdot bv_t$. f_t is the consensus analysts' forecast of earnings for year t+1 and is equal to the I/B/E/S median forecast of earnings for year t+1 measured in June of year t+1. Parameters necessary for calculating ν_t are obtained from panel A and B (values are taken from *IIa-OA* and *IIIa-COP*).

TABLE 4

Valuation Errors

LIM	Constant Discount Rate			Firm-Specific Discount Rate		
	VE	AVE	SQVE	VE	AVE	SQVE
Ia-O	0.459	0.467	0.260	0.452	0.460	0.253
Ib-OCG	0.460	0.465	0.261	0.450	0.455	0.251
Ib-OHC	0.441	0.459	0.251	0.434	0.455	0.245
Ib-OIC	0.458	0.467	0.259	0.451	0.461	0.253
IIa-OA	0.414	0.425	0.216	0.404	0.416	0.209
IIb-OACG	0.415	0.425	0.217	0.401	0.411	0.206
IIb-OAHC	0.400	0.412	0.204	0.389	0.402	0.197
IIb-OAIC	0.413	0.425	0.215	0.402	0.416	0.208
IIIa-COP	-0.506	0.617	0.685	-0.826	0.941	1.618
IIIb-COPCG	-0.542	0.647	0.747	-0.908	1.014	1.867
IIIb-COPHC	-0.668	0.746	0.970	-1.045	1.135	2.329
IIIb-COPIC	-0.520	0.627	0.708	-0.849	0.962	1.694

Notes:

The table presents mean valuation errors. Where $\mathrm{VE} = \frac{\mathrm{P} - \mathrm{V}}{\mathrm{P}}$, $\mathrm{AVE} = |\mathrm{VE}|$, and $\mathrm{SQVE} = (\mathrm{VE})^2$.

The intrinsic value (V) at the end of the fiscal year 2005 is compared to the stock price (P) at the end of the month ending six months after the end of the fiscal year. Abbreviations for the different models are explained in the notes to table 3.

TABLE 5

Correlation between Stock Price and Fundamental Value

LIM	Constant Discount Rate		Firm-Specific Discount Rate	
	Pearson	Spearman	Pearson	Spearman
Ia-O	0.725	0.866	0.736	0.874
Ib-OCG	0.721	0.858	0.735	0.867
Ib-OHC	0.714	0.873	0.722	0.885
Ib-OIC	0.725	0.867	0.732	0.877
IIa-OA	0.824	0.881	0.833	0.891
IIb-OACG	0.822	0.875	0.835	0.882
IIb-OAHC	0.837	0.888	0.845	0.893
IIb-OAIC	0.825	0.883	0.832	0.886
IIIa-COP	0.726	0.855	0.676	0.804
IIIb-COPCG	0.723	0.851	0.673	0.804
IIIb-COPHC	0.727	0.856	0.670	0.799
IIIb-COPIC	0.726	0.856	0.674	0.807

Notes:
The table presents the correlation coefficients between the intrinsic value V at the end of the fiscal year 2005 as calculated by the different models and the stock price at the end of the month ending six months after the end of the fiscal year. Pearson and Spearman correlation coefficients are significantly different from zero on a 1% level for constant and firm-specific discount rates. Abbreviations for the different models are explained in the notes to table 3.

TABLE 6

Predictive Ability of V/P Decile Portfolios with Respect to Stock Returns over the Following Year

Panel A: Constant Discount Rate

LIM Portfolio	*Ia-* *O*	*Ib-* *OCG*	*Ib-* *OHC*	*Ib-* *OIC*	*IIa-* *OA*	*IIb-* *OACG*	*IIb-* *OAHC*	*IIb-* *OAIC*	*IIIa-* *COP*	*IIIb-* *COPCG*	*IIIb-* *COPHC*	*IIIb-* *COPIC*
P1 (low V/P)	0.257	0.257	0.237	0.237	0.247	0.247	0.212	0.247	0.214	0.214	0.214	0.214
P2	0.297	0.297	0.318	0.274	0.255	0.295	0.291	0.255	0.371	0.371	0.371	0.371
P3	0.336	0.336	0.269	0.382	0.356	0.386	0.356	0.356	0.299	0.299	0.299	0.299
P4	0.416	0.416	0.494	0.413	0.310	0.234	0.310	0.304	0.299	0.299	0.299	0.299
P5	0.381	0.381	0.387	0.343	0.506	0.548	0.543	0.548	0.470	0.470	0.470	0.470
P6	0.264	0.264	0.308	0.309	0.384	0.272	0.357	0.341	0.303	0.303	0.303	0.303
P7	0.377	0.361	0.378	0.377	0.239	0.471	0.401	0.263	0.352	0.340	0.340	0.352
P8	0.387	0.403	0.265	0.379	0.483	0.308	0.308	0.460	0.616	0.628	0.628	0.616
P9	0.549	0.549	0.433	0.556	0.514	0.514	0.514	0.514	0.315	0.315	0.315	0.367
P10 (high V/P)	0.504	0.504	0.685	0.504	0.492	0.492	0.492	0.492	0.533	0.533	0.533	0.481
Hedge (P10 - P1)	**0.247**	**0.247**	**0.448**	**0.267**	**0.245**	**0.245**	**0.281**	**0.245**	**0.319**	**0.319**	**0.319**	**0.267**
p-values	(0.242)	(0.242)	(0.066)	(0.197)	(0.242)	(0.242)	(0.155)	(0.242)	(0.090)	(0.090)	(0.090)	(0.242)

Notes:
Table values present equally weighted one year buy-and-hold stock returns for the decile portfolios based on the V/P ratios of the last trading day of June 2006. The hedge portfolio return is defined as the difference in the average return between portfolio P10 and P1. p-values are based on a one-tailed Wilcoxon rank-sum test for differences in medians. It is based on the respective returns of shares in P1 and P10. Abbreviations for the different models are explained in the notes to table 3.

TABLE 6 (continued)

Predictive Ability of V/P Decile Portfolios with Respect to Stock Returns over the Following Year

Panel B: Firm-Specific Discount Rate

Portfolio	LIM	*Ia-* *O*	*Ib-* *OCG*	*Ib-* *OHC*	*Ib-* *OIC*	*IIa-* *OA*	*IIb-* *OACG*	*IIb-* *OAHC*	*IIb-* *OAIC*	*IIIa-* *COP*	*IIIb-* *COPCG*	*IIIb-* *COPHC*	*IIIb-* *COPIC*
P1 (low V/P)		0.226	0.225	0.226	0.225	0.236	0.236	0.236	0.236	0.240	0.207	0.240	0.207
P2		0.303	0.303	0.303	0.303	0.228	0.231	0.231	0.279	0.375	0.408	0.375	0.376
P3		0.369	0.444	0.506	0.455	0.370	0.367	0.367	0.374	0.424	0.424	0.440	0.456
P4		0.469	0.394	0.284	0.353	0.504	0.499	0.512	0.360	0.411	0.411	0.391	0.411
P5		0.298	0.298	0.323	0.317	0.359	0.365	0.351	0.449	0.350	0.350	0.355	0.350
P6		0.327	0.308	0.341	0.391	0.396	0.337	0.396	0.396	0.319	0.356	0.356	0.319
P7		0.346	0.265	0.414	0.392	0.374	0.430	0.374	0.272	0.585	0.554	0.572	0.585
P8		0.393	0.464	0.311	0.305	0.315	0.308	0.315	0.417	0.323	0.323	0.305	0.323
P9		0.543	0.498	0.387	0.490	0.473	0.596	0.514	0.503	0.511	0.511	0.511	0.511
P10 (high V/P)		0.504	0.575	0.685	0.557	0.533	0.410	0.492	0.504	0.237	0.237	0.237	0.237
Hedge (P10 - P1)		**0.278**	**0.349**	**0.459**	**0.331**	**0.298**	**0.174**	**0.256**	**0.268**	**-0.003**	**0.030**	**-0.003**	**0.030**
p-values		(0.197)	(0.197)	(0.066)	(0.197)	(0.120)	(0.350)	(0.242)	(0.197)	(0.650)	(0.591)	(0.650)	(0.591)

Notes:
Table values present equally weighted one year buy-and-hold stock returns for the decile portfolios based on the V/P ratios of the last trading day of June 2006. The hedge portfolio return is defined as the difference in the average return between portfolio P10 and P1. p-values are based on a one-tailed Wilcoxon rank-sum test for differences in medians. It is based on the respective returns of shares in P1 and P10. Abbreviations for the different models are explained in the notes to table 3.

TABLE 7

V/P Decile Portfolios and Median Sharpe Ratio

Panel A: Constant Discount Rate

Portfolio	LIM *Ia-* *O*	*Ib-* *OCG*	*Ib-* *OHC*	*Ib-* *OIC*	*IIa-* *OA*	*IIb-* *OACG*	*IIb-* *OAHC*	*IIb-* *OAIC*	*IIIa-* *COP*	*IIIb-* *COPCG*	*IIIb-* *COPHC*	*IIIb-* *COPIC*
P1 (low V/P)	2.780	2.780	2.780	2.780	3.634	3.634	3.309	3.634	2.780	2.780	2.780	2.780
P2	4.245	4.245	4.301	3.668	2.814	2.814	3.082	2.814	4.773	4.773	4.773	4.773
P3	4.528	4.528	3.116	5.872	4.460	5.872	4.460	4.460	3.633	3.633	3.633	3.633
P4	4.346	4.346	5.332	4.346	4.004	3.451	4.004	3.944	3.744	3.744	3.744	3.744
P5	5.145	5.145	5.403	5.145	5.332	6.308	6.308	6.308	5.332	5.332	5.332	5.332
P6	4.379	4.379	4.379	4.379	3.752	3.752	3.752	3.752	5.034	5.034	5.034	5.034
P7	4.411	4.411	3.758	4.411	2.232	4.411	4.411	3.400	4.165	4.165	4.165	4.165
P8	3.547	3.547	2.555	3.103	4.784	2.943	2.943	3.347	4.374	4.374	4.374	4.374
P9	4.148	4.148	3.586	5.373	5.373	5.373	5.373	5.373	1.907	1.907	1.907	3.836
P10 (high V/P)	4.155	4.155	7.305	4.155	4.155	4.155	4.155	4.155	4.603	4.603	4.603	3.508
p-values	(0.242)	(0.242)	(0.066)	(0.242)	(0.294)	(0.294)	(0.242)	(0.294)	(0.120)	(0.120)	(0.120)	(0.294)

Notes:
Table presents median Sharpe Ratios for shares in decile portfolios based on the V/P ratios of the last trading day of June 2006. p-values are based on a one-tailed Wilcoxon rank-sum test for differences in medians. It is for the respective Sharpe Ratios of shares in P10 and P1. Abbreviations for the different models are explained in the notes to table 3.

TABLE 7 (continued)

V/P Decile Portfolios and Median Sharpe Ratio

Panel B: Firm-Specific Discount Rate

Portfolio	LIM *Ia-* *O*	*Ib-* *OCG*	*Ib-* *OHC*	*Ib-* *OIC*	*IIa-* *OA*	*IIb-* *OACG*	*IIb-* *OAHC*	*IIb-* *OAIC*	*IIIa-* *COP*	*IIIb-* *COPCG*	*IIIb-* *COPHC*	*IIIb-* *COPIC*
P1 (low V/P)	2.455	2.455	2.455	2.455	2.723	2.723	2.723	2.723	2.402	2.134	2.402	2.134
P2	4.773	4.327	4.773	4.327	2.814	3.749	3.749	4.459	3.774	4.773	3.774	4.773
P3	4.460	6.176	6.803	6.176	3.774	3.141	3.141	3.774	3.633	3.633	3.633	3.658
P4	4.899	4.346	4.346	2.181	6.530	6.530	6.530	3.633	5.403	5.403	3.890	5.403
P5	4.385	4.385	3.451	4.140	3.944	4.004	4.210	4.407	3.915	3.915	4.729	3.915
P6	3.752	3.752	5.034	5.407	5.407	5.034	5.407	5.407	5.263	5.263	5.263	5.263
P7	4.821	3.314	5.553	5.225	2.897	5.517	2.897	2.897	5.495	5.239	5.239	5.495
P8	3.511	5.957	2.555	2.999	4.784	2.943	4.784	5.076	3.840	3.840	3.470	3.840
P9	4.964	4.964	2.561	4.964	4.964	7.014	5.373	5.373	5.511	5.511	5.511	5.511
P10 (high V/P)	4.155	4.155	7.305	4.155	4.603	3.508	4.155	4.155	3.398	3.398	3.398	3.398
p-values	(0.120)	(0.120)	(0.032)	(0.120)	(0.066)	(0.242)	(0.155)	(0.155)	(0.197)	(0.120)	(0.197)	(0.120)

Notes:
Table presents median Sharpe Ratios for shares in decile portfolios based on the V/P ratios of the last trading day of June 2006. p-values are based on a one-tailed Wilcoxon rank-sum test for differences in medians. It is for the respective Sharpe Ratios of shares in P10 and P1. Abbreviations for the different models are explained in the notes to table 3.

TABLE 8

Estimation Results for Probit Regression

$ins_j = \delta_0 + \delta_1 \cdot \log(mvff_j) + \delta_2 \cdot US\_GAAP_j + \delta_3 \cdot local\_GAAP_j$				
δ_0 : -0.7802 (0.055)*	δ_1 : 0.5585 (0.001)***	δ_2 : 1.1191 (0.062)*	δ_3 : -0.3240 (0.320)	McFadden R^2 15.48%

Notes:
The equation is estimated using a cross-sectional probit regression for data of the year 2004. Figures in parentheses are p-values based on z-statistics. The variable ins_j is coded 1, if a firm j is in the sample and zero otherwise. $\log(mvff_j)$ is the natural logarithm of the free float market value (divided by 1.000.000) at the end of the year 2004. The variables US_GAAP_j and $local\_GAAP_j$ denote the applied accounting standard in the year 2004. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.