Essays in Corporate Finance and Accounting

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Essays in Corporate Finance and Accounting

Thesis

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Chapter 1

Introduction

This thesis contains three research papers – all in different fields. The first paper in Chapter 2 approaches the problem of drawing inferences from companies that do not compare in size, a problem that frequently causes inferential problems in accounting and finance research and that accounting scholars refer to as the scaling problem. The second paper in Chapter 3 studies companies that choose to become a Societas Europaea, a new European legal form. In particular, the paper documents where and when companies incorporate and what changes in the company alter shareholder value. The last paper in Chapter 4 backs out those financial analysts that are optimists and pessimists. The paper links analysts' attributes to optimists and pessimists and generates an improved forecast that would entail if there were no optimists nor pessimists.

In finance and accounting, researchers often identify a common economic phenomenon by comparing companies of different sizes. Examples include: relating company valuations to the company's corporate governance, relating a company's abnormal accruals to the quality of its auditor or relating the market capitalization of a company to its earnings. If researchers do not control for size they do not know if the economic effect that they identify is related to size or to some other reason. Most often, the researcher wants to establish the "other reason" and therefore must employ a size correction approach. The traditional approach is to divide the size affected variables by a size proxy. This approach has drawbacks, however. First, to be meaningful, the size proxy must be positive, a requirement, that where it is not met,

leads to the systematic exclusion of observations and therefore hampers generalization to all companies. Second, even if all companies are included in the analysis, some companies can have size proxies that are close to zero, size proxies that will therefore make the divided variable very large. These large values can cause problems for statistical methods that identify economic effects. Third, the traditional approach implicitly assumes that the variables that relate to size, relate to size proportionally. It is not clear, however, why this assumption should be true for all variables. On the contrary, economists frequently assume that output is not proportional to input.

Chapter 2 mitigates the size problem by a simple transformation, the inverse hyperbolic sine. The transformation turns the multiplicative effect of size into an additive effect that is proxied by an additive size proxy. The disappearance of the multiplicative effect solves the three problems of the traditional approach: the size proxy can now become negative and the size proxy can be close to zero without unduly influencing the statistical estimation procedures. Moreover, size need not be proportional to the variables that the researcher investigates.

Chapter 2 documents that this transformation approach produces results that are economically intuitive while the traditional approach often produces unintuitive results. The transformation approach has better statistical properties than the traditional approach for ordinary least squares estimation, certainly the most widely estimation technique in economics. In one setting, where market capitalization is predicted with two accounting numbers, earnings and book value, the traditional approach has a root mean squared error that is about 2.5 times higher than the root mean squared error of the transformation approach.

Chapter 3 studies companies that become a Societas Europaea (SE). The SE is a new legal form, born in 2001, that is in part governed by European Union law. The European Commission created the SE to allow European companies to easier change their seat within the EU, to easier merge with other EU companies, to more flexibly manage its worker involvement and to more flexibly choose its management structure. While the SE could create shareholder value through less costly mergers, more efficient organisation of business units or better tailored worker in-

volvement, it could also destroy value if managers use the SE to consolidate their power in the company in order to follow their own agenda (e.g. build empires, consume perks). Chapter 3 studies how SEs create and destroy value.

While I do not find significant announcement returns following the change of worker involvement in the company, I find that companies that work in regulated industries have 2.7 percentage points higher abnormal returns than companies in unregulated industries. In contrast, companies that change their management structure from two-tier (management board and supervisory board) to one-tier (board of directors) have 3.7 percentage points lower abnormal returns than companies that keep their management structure. The findings conform to the view that the SE destroys value if managers use it to weaken their monitoring by abolishing the supervisory board. In contrast, the SE's flexibility to change its seat is valuable to companies that operate in regulated industries, industries whose profitability depends on state permits or state subsidies. At last, Chapter 3 finds that companies that become SEs are already underperforming their industry peers before they change legal form.

Chapter 4 studies the behavior of financial analysts. For a theory of capital markets it is important to understand how the participants in these markets behave. For a theory of accounting it is important to understand how users of the financial statement use accounting numbers. Since financial analysts are expert participants in capital markets and expert users of financial statements, the study of financial analysts provides important inputs for a theory of capital markets and a theory of accounting. In Chapter 4, Ingolf Dittmann and I explore the possibility that financial analysts persistently provide forecasts that are wrong. Financial analysts that persistently forecast too high earnings are optimists and those analysts that forecast too low earnings are pessimists.

Our model provides empirical evidence that indeed analysts are optimists and pessimists. Our model classifies 73 % of all analysts as optimists and 27 % as pessimists. We find that optimists are less optimistic if they work for larger brokers. In contrast, pessimists do not become less pessimistic if they work for larger brokers. We do not find evidence that analysts'

experience explain their optimism or pessimism. As a practical consequence of our model we can derive an earnings forecast that corrects individual forecasts for optimism and pessimism. This forecast is more precise than conventional forecasts such as the consensus forecast (the average of all individual forecasts). Our forecast can also explain more variation in earnings per share than conventional forecasts.

As the thesis studies diverse fields its contribution to contemporary research is diverse. Chapter 2 contributes to a large literature because size differences impede inference in many areas in finance. The proposed transformation approach may improve: Capital structure studies, payout policy studies and valuation studies. Examples in accounting include: Value relevance studies and earnings quality studies.

Chapter 3 not only helps policy makers to understand how companies use SE legislation but also to improve it. In particular, policy makers should insure that the monitoring role of the board is not impaired if SEs change their board structure. Chapter 3's research design contributes to the corporate governance literature that studies the effectiveness of boards. Many such studies suffer from a reverse causality problem: Does weak monitoring lead to lower valuations or do lower valuations lead to weak monitoring (for example low value companies have more stable cash flows that are easier to verify and therefore need less monitoring)? In contrast, Chapter 3's research design does not suffer from the reverse causality problem.

Chapter 4 deepens the knowledge about expert capital market participants. Our model provides the means to compare an analyst's optimism across companies. In addition, Chapter 4 provides an improved earnings forecast that can readily be used by practitioners. Although we currently do not investigate whether analysts' incentives or character traits explain their optimism our model provides an input to study these question in a later stage of the project. For example, a comparison of optimism across firms can help explain why analysts are optimistic. If analysts are optimistic to get better information from a more benign management, an analyst would tend to be more optimistic for companies that have more idiosyncratic information. In contrast, if optimism is a character trait one would expect that optimism changes little if an

optimistic analyst issues forecasts for a different company.

Chapter 2

Mitigating scale effects in finance and accounting research: A simple transformation approach

This paper proposes a simple approach to mitigate scale differences among a cross section of companies. In applications in accounting and corporate finance many firm characteristics scale up with firm size: Compared to small firms, large firms pay larger dividends, large firms have larger depreciation, large firms have more debt. Often researchers aim to compare companies not on a total dollar basis but on a different scale that makes companies of different sizes comparable. The common approach in prior literature is to divide the variable that scales by size by a size proxy. The approach in this paper, in contrast, is to transform variables that scale by size by a logarithmic like transformation (the inverse hyperbolic sine), that is also defined for non positive values, and to include an additive size proxy. The log like transformation turns the problem of introducing a common scale into an omitted variable problem – a problem that has been intensively studied in the statistics and econometrics literature. The approach proposed in this paper has two advantages. First, the approach avoids the singularity problems that arise in the traditional approach when the size proxy is close to zero. Second, the proposed approach is

applicable for size proxies that can become negative and therefore avoids the sample selection problems that might arise if the size proxy is required to be strictly positive.

For most of the paper the strategy is to contrast the proposed transformation approach with the traditional approach by employing the same size proxy in both approaches. This procedure ensures that the better performance of the transformation approach, that is demonstrated in the paper, is solely due to different combination of the same information.

The paper has 2 major findings. First, in comparison with the traditional approach, the proposed transformation approach yields results that are more consistent with theory and less dependent on the size proxy employed. Specifically, for regressions of market value of equity on gross margin, the proposed transformation approach yields coefficient estimates that are higher in magnitude for positive gross margin than for negative gross margin; consistent with the argument that for a going concern profits should be more informative than losses. In contrast, the regressions that use the traditional approach sometimes yield positive gross margins that are uninformative about market value or losses that have higher (positive) impact on market value than profits. In a second application, the pricing of depreciation expense, the transformation approach always prices depreciation expense not at all or negatively – consistent with theory. In contrast, in some specifications that employ the traditional approach depreciation expenses are positively priced – inconsistent with theory.

The second main finding: The econometric properties of the proposed approach are closer to standard ordinary least squares assumptions than the traditional approach. In particular, analyses of annual cross sections, in the spirit of Easton and Sommers (2003), demonstrate that the proposed transformation approach yields specifications that have among the lowest deviations from homoskedasticity, lack of fit and out of sample pricing error.

The paper contributes to the discussion how to overcome scale effects in market based accounting research (Christie, 1987; Landsman and Magliolo, 1988; Kothari and Zimmerman, 1995; Barth and Kallapur, 1996; Brown et al., 1999; Easton and Sommers, 2003; Lo, 2004; Barth and Clinch, 2009; García Lara et al., 2009). Although the applications chosen in the pa-

per are in the field of market based accounting research, the approach can be used in any setting where multiplicative size effects threaten causal inference. The proposed approach provides a systematic way to mitigate size effects and thereby to improve inference.

2.1 Scale effects in cross sectional research designs

In the presence of short time series, the identification of economic effects in the corporate finance and accounting literature relies on cross sectional variation. In the cross section variables are often correlated because they are scaled by some common size factor. For example, market value of equity and sales are highly correlated because they both depend on size; large companies have more resources and can therefore generate higher sales. In general, large companies have more of X and therefore need more of Y. Often researchers want to compare companies as if they operated on the same scale without being specifically interested in size effects. Therefore, researchers have to introduce a common scale for all companies.

In many finance applications the common scale is the value of the company's assets at replacement costs. Here, the methodological issue is to find good proxies for replacement cost to generate reliable measures of Tobin's q (Lewellen and Badrinath, 1997). The accounting literature focusses more on the econometric properties of models that employ different size proxies. What theoretical construct these size proxies measure, is left unspecified. The dominant approach to mitigate size effects in the finance and accounting literature is to divide all size affected variables by a common size proxy. Lev and Sunder (1979) identify four problems with this approach. First, the size proxy may be imperfect. If the size proxy measures size with additive error then the ratio of the variable under interest (e.g., market value of equity) and the size proxy will still depend on size. Therefore, it is impossible to infer in how far the variable of interest or size is associated with the dependent variable. Second, the dependence between size and size proxy might be non proportional. For example, if size is replacement cost of the company's assets and the size proxy is book value of total assets then replacement

costs could increase faster than book values as young firms will invest more in intangible assets that are not capitalized, yet are part of replacement costs. As young firms mature and begin to harvest, their growth options decline and a larger part of their replacement costs will consist of assets on the balance sheet. If market values were then divided by book value of total assets, the proxy for replacement cost, one would erroneously conclude that younger firms create more value as they have higher Tobin's q. Third, dividing variables by a size proxy can lead to wrong inferences of the association between two scaled variables: Two variables $\frac{X^*}{S}$ and $\frac{Y^*}{S}$ can have zero correlation if the true scale S is observable, yet $\frac{X^*}{\hat{S}}$ and $\frac{Y^*}{\hat{S}}$ can have non zero correlation if the size proxy $\hat{S}$ is employed. Last, size proxies, such as book value of equity or net income, can become zero or negative. If companies have a zero or negative size proxy they must be excluded, which raises concerns of selection bias, or the analysis cannot be carried out. Both outcomes are unsatisfactory.

In its methodological treatment of size effects, the accounting literature has focussed on applications where market values or returns are regressed on accounting numbers (for example regressions of market value of equity on earnings and book value). What is the correct scale in this setting? As Christie (1987) observes, if the dependent variable is returns then the scale is clear: all variables that are affected by size should be deflated by past realizations of market value of equity. However, if the dependent variable is market value of equity then the choice of the size proxy does not only depend on the assumptions about the underlying pricing relationship, as Landsman and Magliolo (1988) note, but also on what economic variables the researcher wants to explain. In contrats, if the researcher wants to explain if an accounting variable is useful in making inferences about the market value of the company then no size proxy needs to be included because scale is dollars of market values. If the researcher wants to explain if an accounting variable is associated with intangible assets then the scale is tangible assets and a size proxy could be tangible assets as reported on the balance sheet adjusted for inflation. To sum up, the quality of the size proxy should only become prominent after the theoretical construct of scale is specified. However, as Lev and Sunder (1979, p.194) observe:

> "Unfortunately, in most empirical applications the choice of a specific size measure is made in an ad hoc manner, often leading to ambiguities in the interpretation and generalization of empirical findings."

Nevertheless, even if the theoretical construct is market value of equity, dividing all regression variables by a size proxy could be justified to overcome heteroskedasticity or nonlinearities in the valuation function – all purely econometric reasons. This is the approach taken by Barth and Kallapur (1996); Easton and Sommers (2003); Barth and Clinch (2009); García Lara et al. (2009); Lo (2004). These studies recommend size proxies based on simulation studies (Barth and Kallapur, 1996; Lo, 2004; Barth and Clinch, 2009) or the analysis of regression residuals (Easton and Sommers, 2003). Easton and Sommers (2003) argue that size differences between companies are not only a problem of heteroskedasticity, that in general leads to inefficient use of the information in the sample but to consistent estimates, but a cause for coefficient bias. If larger companies act economically different than smaller companies and if larger companies are overweighted in regressions, as would be the case under size induced heteroskedasticity, then ordinary least squares estimation results in biased coefficient estimates: The coefficient estimates are more representative for the way that large companies do business than the way small companies do business. Hence, Easton and Sommers (2003) suggest that the division of regression variables by a size proxy is a means to overcome differences in the way large and small companies do business that show up as nonlinearities in the dependence of market value on accounting numbers. Easton and Sommers (2003) demonstrate that the residual variation increases in market value for cross sectional regressions of market value on book value of equity and net income. They observe a similar pattern for lack of fit; companies with the highest market value have the highest residuals and therefore influence the estimated coefficients more than companies with lower market value. Easton and Sommers (2003) argue that dividing all regression variables by market value can mitigate some of this influence. In contrast, Barth and Clinch (2009), by simulating Ohlson (1995)'s model augmented with a normal error and different ways in which size can affect inferences, recommend either not to divide by size

proxies at all or divide by the number of shares outstanding. García Lara et al. (2009) impose additional assumptions on the Ohlson (1995) model and conclude that the standard deviation of market value is the correct deflator. In a sample of COMPUSTAT firms, they find some support for their conjecture. Finally, Ye (2007) proposes, based on his finding of lower pricing errors for his approach, to weight by estimated market value if it is smaller than actual market and vice versa. In general, the literature has come up with a plethora of size proxies but fails to agree on an optimal proxy.

All the studies that base the choice of size proxy on purely econometric reasons, such as heteroskedasticity or lack of fit, divide the regression variables by other random variables. Therefore these studies could change the economic interpretation of the regressions. For example, if book value of equity is the size proxy then the dependent variable is the market to book ratio which proxies a different economic construct than market value. Hence, if the purpose is to explain market value of equity it is invalid to divide all variables by book value of equity even if this resulted in better econometric properties because market-to-book ratio is a different construct than market value. Thus a recommendation for the best size proxy by these studies can only be made, if all size proxies that are considered, proxy for the same construct of scale.

Prior research not only uses parameter estimates but also the coefficient of determination for inference. Brown et al. (1999) demonstrate that in the presence of size effects the practice of comparing coefficients of determination (Collins et al., 1997; Francis and Schipper, 1999) as a way to compare differences in value relevance is misleading. Although Gu (2007) proposes an alternative measure for across sample comparison of value relevance, this approach is also suspect to size effects.

In summary, the discussion demonstrates that size effects are a serious impediment to causal inference in cross sectional research designs. Even if a good size proxy can be found on theoretical grounds, scaling the regression variables by the size proxy and estimating the specification by ordinary least squares, the dominant approach in the literature, can result in econometric problems such as coefficient bias and heteroskedasticity. To this date the accounting literature

lacks a commonly accepted size proxy.

2.2 The transformation approach

In this section I outline an approach to mitigate scale effects in cross sectional studies in market-based accounting research. The basic idea is to turn scale into an omitted variable that enters the regression equation additively. The problem of mitigating scale effects is then the problem of finding suitable size proxies.

Several studies assume a multiplicative size effect:

$$\text{MVE} = \alpha_0^* S + \alpha_1^* S \times \text{BVE}^* + \alpha_2^* S \times \text{EARNS}^* + S \times \varepsilon^* \tag{2.1}$$

where firm subscripts are omitted, $\text{MVE}^* = \frac{\text{MVE}}{S}$, BVE^* and EARNS^* are size-free market value, book value of equity and earnings, respectively and S is size (equation (2) in Barth and Clinch, 2009). The problem is that the researcher can observe only the size affected variables but not the size directly. In consequence, if the size affected variables are regressed on each other it is impossible to tell whether associations are between the underlying size-free constructs or between size. The majority of prior literature mitigates this scale problem by dividing Equation (2.1) by a size proxy.

Another approach, is to take the logarithm of the variables to turn the multiplicative scaling of Equation (2.1) into additive scaling:

$$\log(\text{MVE}^*) + \log(S) = \beta_0 + \beta_1 \times \log(\text{BVE}^*) + \beta_2 \times \log(\text{EARNS}^*) + \beta_3 \times \log(S) + \nu \tag{2.2}$$

The approach is problematic for two reasons. First, if Equation (2.1) is correctly specified then Equation (2.2) cannot be correctly specified. In particular, the error term ν will be correlated with the independent variables. Second, Equation (2.2) cannot be estimated for firms that take on negative values on earnings, book value of equity and market value.

The first problem of inconsistency between Equation (2.1) and Equation (2.2) does not invalidate taking the logarithm of all variables outright, however. On the one hand, in the absence of strong assumptions about the earnings behavior through time and its correlation with other variables, it is likely that the error term in Equation (2.1) is also correlated with earnings and book value of equity. Indeed, prior literature interpretes a significant coefficient on earnings as evidence that earnings are relevant for valuing companies. Whether this value relevance derives from production efficiency, high quality products, superior cost management, hubris or some other factor is left unspecified. Instead, researchers interprete earnings as a proxy for one of those factors or a combination of those factors.[1] On the other hand, it is not clear whether Equation (2.1)'s functional form is correct. Starting with Hayn (1995) and Burgstahler and Dichev (1997), studies document that the linear specification is incorrect (see also for theoretical models Zhang, 2000; Tippett and Yilmaz, 2002; Ataullah et al., 2009). Hence, it is possible that Equation (2.2) is correctly and Equation (2.1) incorrectly specified.

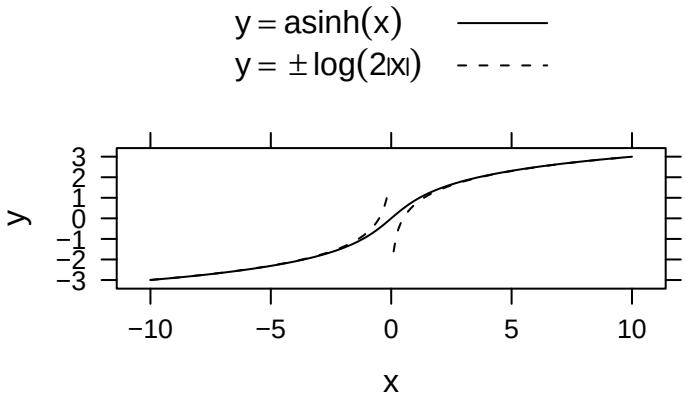


Figure 2.1: The inverse hyperbolic sine

This figure shows the inverse hyperbolic sine (bold) and its asymptote $\operatorname{sign}\log(2|X|)$

The solution to the second problem, that the logarithm is only defined for positive values,

[1] If the error term in Equation (2.1) was uncorrelated with earnings this would raise the question why there are other items in the income statement. These items would be value irrelevant and thus would have to cater to the information needs of other stakeholders. Given the large body of literature that demonstrates that other items in the income statement are value relevant this explanation is implausible.

is to introduce a different transformation that is similar to the logarithm, yet is defined for all (real) values. This transformation, depicted in Figure 2.1, is the inverse hyperbolic sine (*asinh*). The *asinh* tends asymptotically to $\text{sign}(x)\log(2|x|)$; around zero it does not transform the data at all (it is well approximated by the identity function at zero). Similar to the logarithm, the *asinh* transformation moves observations with large magnitude to the center of the distribution. In contrast, to the logarithm the *asinh* preserves the sign of the original variable. While it is uncommon to use the *asinh* transformation in finance and accounting research, the statistics and econometrics literature has stressed its virtues for some time (Burbidge et al., 1988; MacKinnon and Magee, 1990).

In contrast to the traditional approach of dividing the regression equation by a size proxy, the transformation approach avoids the singularity issues that appear if the divisor is close to zero; if the divisor approaches zero the resulting observations in the regression equation will become very large. The proposed transformation approach also does not suffer from the sample selection problems that arise because the divisor must be positive (e.g. the exclusion of companies with negative book value). Moreover, instead of assuming that all regression variables are proportional to one size proxy as in the current approach, the transformation approach allows multiple size proxies that can have a different relationship to the regression variables than being proportional.

Figure 2.2 and Figure 2.3 illustrate the transformation approach. Figure 2.2 depicts a scatterplot of the *asinh* of market value against the *asinh* of earnings before extraordinary items for COMPUSTAT manufacturing companies.[2] The point cloud resembles a "V" shape where the vertex is very close to zero; the shape expresses the familiar finding of Hayn (1995) that market value increases in losses and profits. I scaled the *asinh* so that each unit change on any of the axis corresponds approximately to a doubling of untransformed earnings and untransformed market value. As is evident from Figure 2.2, a doubling of losses increases market value about

[2]Market value is from CRSP six month after financial year end. Companies must have non missing book value of equity (COMPUSTAT item: seq) and earnings before extraordinary items (COMPUSTAT item: ib), information on share prices and shares outstanding six month after financial year end and have the first digit of the standard industrial classification code (SIC) equal to 2 or 3.

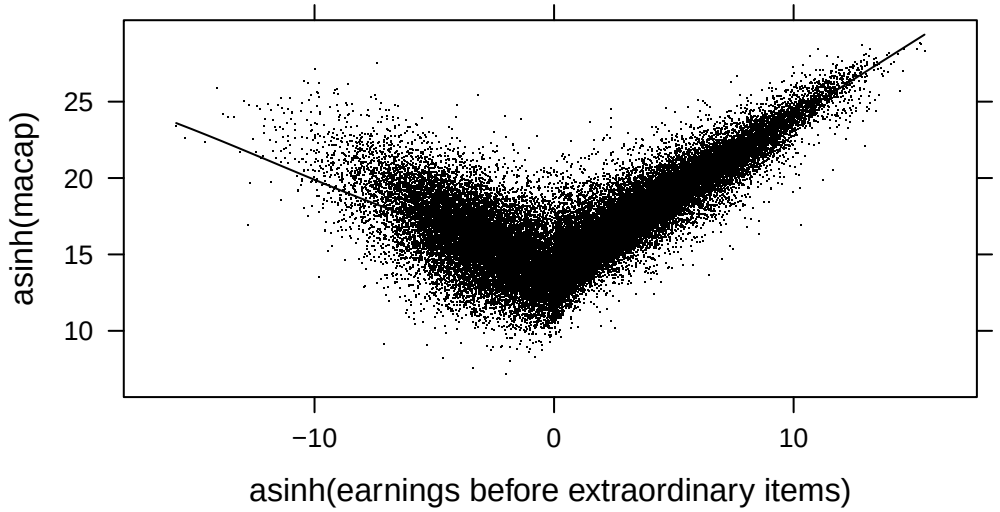


Figure 2.2: Scatterplot of market value against earnings before extraordinary items

This figure shows a scatterplot of the inverse hyperbolic sine of market value against the inverse hyperbolic sine of earnings for US manufacturing companies. The inverse hyperbolic sine is scaled so that its asymptote is $\text{sign} \times \log_2(|x|)$. Hence, a one unit change on this scale corresponds to a doubling on the original scale.

1.7 times. The presence of size effects forces itself on as an explanation for this unintuitive finding. As a consequence of the relationship of the *asinh* to the logarithm the scatterplot is similar to a scatterplot of $\log(\text{MVE}^*) + \log(S)$ against $\log(\text{EARNS}^*) + \log(S)$ for profitable companies and similar to a scatterplot of $\log(\text{MVE}^*) + \log(S)$ against $-\log(|\text{EARNS}^*|) + \log(S)$ for companies that make losses. If size is large relative to the size free variables (MVE^* and EARNS^*) one would expect a "V" shaped relationship between the *asinh* of market value and the *asinh* of earnings that masks the relationship between size free market value and size free earnings. The transformation approach corrects for the masking of the relationship between size free market value and size free earnings by controlling for size additively.

Figure 2.3 depicts the relationship between the *asinh* of market value and the *asinh* of earnings before extraordinary items for the same COMPUSTAT sample of manufacturing firms after book value of equity, the size proxy, has been "partialled out".[3] If book value of equity is a

[3] "Partialled out" market value is the residual from a regression of the *asinh* of market value on an intercept and the *asinh* of book value of equity where the coefficient on the book value of equity can change between positive

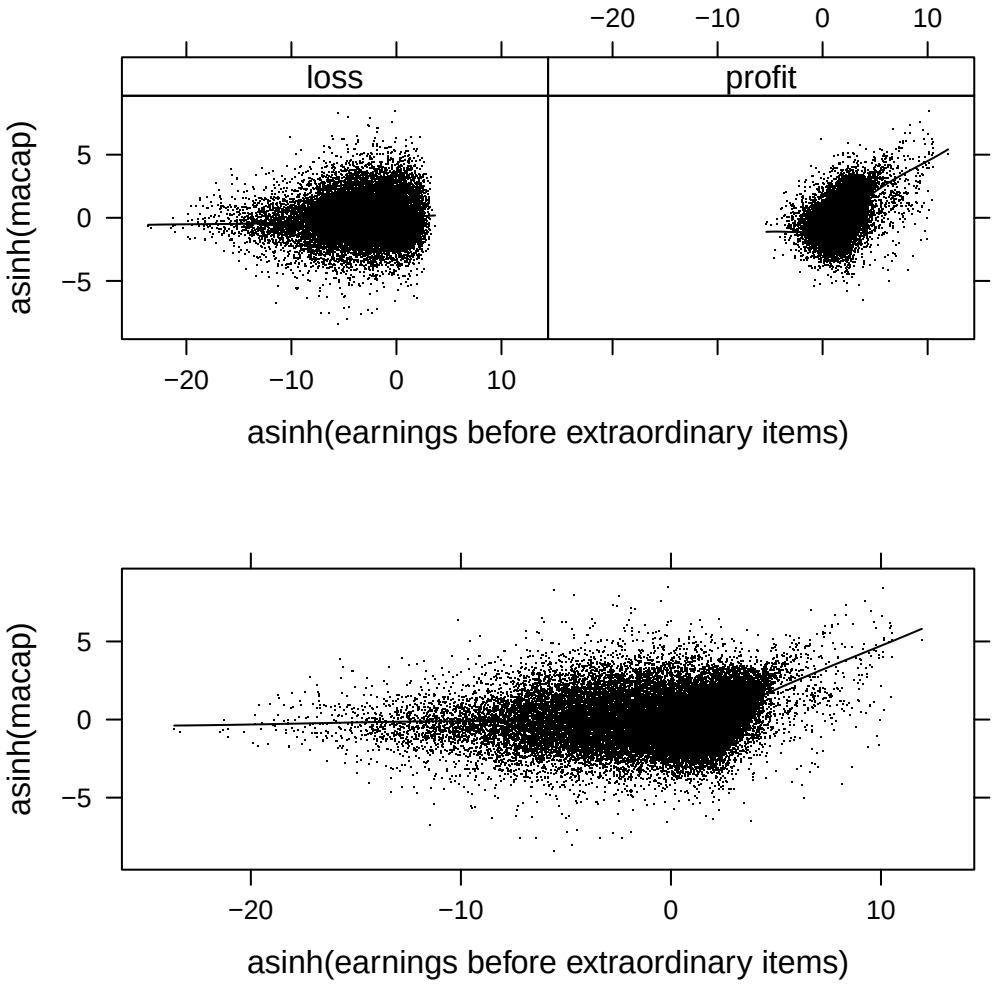


Figure 2.3: Scatterplot of size corrected market value against size corrected earnings before extraordinary items

This figure shows a scatterplot of the size corrected inverse hyperbolic sine of market value against the size corrected inverse hyperbolic sine of earnings for US manufacturing companies. The inverse hyperbolic sine is scaled so that its asymptote is $\text{sign} \times \log_2(|x|)$. Hence, a one unit change on this scale corresponds to a doubling on the original scale. The inverse hyperbolic sine of market value and the inverse hyperbolic sine of earnings are orthogonal to the inverse hyperbolic sine of book value of equity, the size proxy, in this figure.

good size proxy then Figure 2.3 is a scatterplot of the *asinh* of size corrected market value against the *asinh* of size corrected earnings. The top panel of Figure 2.3 splits the scatterplot for loss firms (left) and profitable firms (right). The bottom panel contains all firms. Superposed the point cloud, the flat smooth curve indicates that there is no dependence between size corrected market value and size corrected losses: The unintuitive relationship between losses and market value vanished. The scatterplot in the bottom panel strongly resembles the hypothesized relationship in Burgstahler and Dichev (1997, Figure 1); investors do not have to incur losses forever but instead have the option to abandon the firm, therefore losses should not signal market value.

In conclusion, the transformation of the regression variables by the inverse hyperbolic sine and inclusion of size proxies in the regression equation is another approach that can potentially mitigate scale effects. The graphical illustration of this section can accomodate the unintuitive result that market value increases in losses.

2.2.1 The choice of size proxies

The question remains what size proxies to include in the regression equation or whether to include a size proxy at all. The answer depends on the research question that defines the theoretical construct of scale. If the research addresses the question whether particular financial statement items are relevant for the valuation of companies, then it can be argued that no size proxy should enter the regression equation because size is value relevant and therefore anything associated with size will also be value relevant. For example, the financial statement user can infer from the size of depreciation how valuable the company is relative to other companies in the same way that knowledge of fuel consumption of a car is relevant to the buyer of a car (more powerful engines use more fuel and are more expensive). Indeed, the financial statement

and negative book value of equity. "Partialled out" earnings is the sum of residuals from two regressions. The first regression regresses the *asinh* of earnings for positive earnings and zero otherwise on an intercept and the *asinh* of book value of equity where the coefficient on the book value of equity can change between positive and negative book value of equity. The second regression regresses the *asinh* of earnings for negative earnings and zero otherwise on an intercept and the *asinh* of book value of equity where the coefficient on the book value of equity can change between positive and negative book value of equity.

is often used in this way when private companies change hand for a multiple of sales revenue. On the other hand, if the aim is to test whether financial statement items are associated with positive net present value investments three applications come to mind.

First, market-based accounting studies often motivate their specifications with the models described in Ohlson (1995) and Feltham and Ohlson (1995).[4] In these models, book value of equity is the size proxy and everything else that is not related to size is related to residual income. Hence, the size corrected *asinh* of market value must be viewed as the *asinh* of the present value of residual income. Feltham and Ohlson (1995) note that residual income contains the understatement of book value with respect to the current market value of the company's asset and hence residual income contains effects of conservative accounting.

In contrast, the second type of application, that prevails in the finance literature, excludes effects of conservatism in its scale construct. Scale is the replacement cost of total assets and size corrected *asinh* of market value is the *asinh* of Tobin's q (Tobin and Brainard, 1977).[5] Size proxies that are frequently employed are book value of equity or book value of total assets.[6] Replacement costs for intangible assets can be proxied by sales, research and development expense or advertising expenses.

The third research application is directed at explaining differences in market value between two points in time. The scale is historical market value and size corrected market value is the *asinh* of the difference between expected future cash flows today and expected future cash flows in the past.

In conclusion, given the diverse focus of these research applications, correcting for size is not purely an econometric exercise but also depends on the research questions that is asked.

[4] Holthausen and Watts (2001) provide an overview of these applications in market-based accounting research.

[5] For applications in corporate finance see among many others (Morck et al., 1988; Yermack, 1996; Baker et al., 2003; Faleye et al., 2006; Wang and Xie, 2009).

[6] More involved proxies for replacement costs are available (see Lewellen and Badrinath, 1997, for an example).

2.3 Application of the transformation approach

This section describes the application of the transformation approach in two different settings; the pricing of depreciation and the pricing of gross margin. The aim of the section is to demonstrate that while the transformation method yields results that make economic sense, the traditional scaling approach yields results that are often economically unintuitive.

2.3.1 The pricing of gross margin

The first application tests how gross margin, defined as sales minus cost of goods sold, relates to market value. Controlling for size, large positive gross margins signal the ability to demand high premiums relative to manufacturing costs. If competitors need time to erode large gross margins and consumer preferences are stable than gross margin will persist for a while and will therefore correlate with market value. In contrast, large negative gross margins signal that customers are not willing to pay a price that is higher than the production cost of the company's products. Owners will not tolerate negative gross margin forever but will rather choose to abandon the business. Therefore, depending on investors tolerance negative gross margins should be positively associated with market value, it should decrease value, or have no effect at all.

Table 2.1 contains statistics from a regression of market value on gross margin for different size proxies. While Panel A of Table 2.1 contains regression statistics for the transformation approach, Panel B contains regression statistics for the traditional approach that scales all regression variables by a size proxy. Specifically, Panel A contains statistics from the regression model:

$$\begin{aligned} \mathrm{MVE}^{\dagger}_{i,t} = \delta_0 + \delta_1 \mathrm{GM}^{\dagger}_{i,t} \times \mathrm{NGM}_{i,t} + \delta_2 \mathrm{GM}^{\dagger}_{i,t} \times (1 - \mathrm{NGM}_{i,t}) \\ + \delta_3 \mathrm{S}^{\dagger}_{i,t} + \mathrm{Time}_t + \mathrm{NGM}_{i,t} + \mathrm{Firm}_i + \eta_{i,t} \end{aligned} \tag{2.3}$$

for firm i at time t. $\mathrm{y}^{\dagger} = \mathrm{asinh}(y)$, GM is gross margin, NGM is an indicator that is 1 if GM < 0

and zero otherwise and S is one of the different size proxies indicated in the last rows of Panel B. In contrast, Panel B contains statistics from the regression:

$$\frac{\text{MVE}}{\text{S}}_{i,t} = \gamma_0 + \gamma_1 \frac{\text{GM}}{\text{S}}_{i,t} \times \text{NGM}_{i,t} + \gamma_2 \frac{\text{GM}}{\text{S}}_{i,t} \times (1 - \text{NGM}_{i,t}) + \gamma_3 \frac{\text{BVE}^{\dagger}}{\text{S}}_{i,t} + \text{Time}_t + \text{NGM}_{i,t} + \text{Firm}_i + \xi_{i,t} \tag{2.4}$$

The regression statistics are OLS estimates; standard errors are clustered by the firm and year.[7] Many of the size proxies that Lo (2004) compiles by surveying prior accounting literature are in Table 2.1.[8]

The first column of Table 2.1, Panel A, contains coefficient estimates when no size proxy is included in the regression. Without controlling for size, market value changes by about 0.61 % for a 1 % change in positive gross margin and by about 0.33 % for a 1 % change in negative gross margin.[9]

So, contrary to the argument above, negative gross margin has a negative association with market value; losses are priced positively. Except for the size proxy, lagged market value, inclusion of the other size proxies in the regression does not alter the effect, although the effect is attenuated. If lagged market value enters the regression the pricing of negative gross margin vanishes. Most generally, all size proxies are positively correlated with market value and positive gross margin is on average higher priced than negative gross margin; consistent with the notion that positive gross margin should inform the company's future cash flows more than negative gross margin.

The results in Panel B oppose this notion. Except for the specifications that divide the regression variables by sales or shares outstanding, a percentage change in negative gross margin

[7] The sample, drawn from COMPUSTAT and CRSP, is North American-companies between 1960 and 2009 with positive size proxies. Market value is share price multiplied by shares outstanding six month after the fiscal year end.

[8] Specifically, Table 2.1 includes: lagged total assets (AT_{t-1}), book value of equity (BVE), total assets (AT), sales (SAL), shares outstanding (SHROUT) and lagged market value (MVE_{t-1}). Note, that it might be problematic to use sales as a size proxy because it might be correlated with size corrected earnings. I include it, nevertheless, because it is often employed in prior research.

[9] In Equation 2.3 slope coefficient are approximately equal to point elasticities.

Table 2.1: Regressions of market value on gross margin for different size proxies and different methods that mitigate scale effects

This table contains coefficient estimates and their standard errors for regressions of market value on gross margin and size proxies. In *Panel A* all variables are transformed by the inverse hyperbolic sine. In *Panel B* all variables are divided by the size proxy indicated in the row labelled "Scale". All regressions include firm and year fixed effects and different intercepts for companies that have negative gross margin and positive gross margin. Standard errors are clustered by firm and year. The adjusted R^2_{adj} measures the percent of remaining variation that is explained by the regression variables after the fixed effects on market value are partialled out. Significance codes: $\bullet \sim 10$ %, $^{*} \sim 5$ %, $^{**} \sim 1$ % , $^{***} \sim < 1$ %

Panel A: Additive control for size (transformation approach)

	Dependent variable:						
Variable	MVE						
GM×	-0.325***	-0.285***	-0.117***	-0.118***	-0.248***	-0.173***	-0.019
NGM	(0.026)	(0.021)	(0.017)	(0.020)	(0.020)	(0.021)	(0.016)
GM×	0.614***	0.562***	0.297***	0.332***	0.499***	0.391***	0.158***
$(1-\text{NGM})$	(0.013)	(0.015)	(0.010)	(0.015)	(0.017)	(0.013)	(0.010)
TA_{t-1}		0.088***					
		(0.020)					
BVE			0.500***				
			(0.012)				
TA				0.447***			
				(0.017)			
SAL					0.160***		
					(0.017)		
SHROUT						0.605***	
						(0.019)	
MVE_{t-1}							0.676***
							(0.019)
R^2_{adj}	26.2 %	26.5 %	37.3 %	31.4 %	26.9 %	38.7 %	55.6 %
N	139,842	139,842	139,842	139,842	139,842	139,842	139,842

Panel B: Division by size (traditional approach)

	Dependent variable:					
Variable	MVE	MVE	MVE	MVE	MVE	MVE
GM×	-2,548.6***	-7,437.7**	-1,114.6**	-657.3	-9,620.6***	2,118.0***
NGM	(418.6)	(2,571.5)	(405.1)	(1,442.3)	(2,417.9)	(588.9)
GM×	1,969.5***	-788.2	199.5*	-6,681.4	902.9***	-1,898.5***
$(1-\text{NGM})$	(172.1)	(737.1)	(79.5)	(10,230.3)	(85.9)	(530.9)
BVE	1,404.8***	1,886.4***	93.5	1,920.5***		2,455.1***
	(98.5)	(529.5)	(86.5)	(223.2)		(208.3)
Scale	TA	TA_{t-1}	MVE_{t-1}	SAL	BVE	SHROUT
R^2_{adj}	3.4 %	14.6 %	6.2 %	60.3 %	71.2 %	72.9 %
N	139,842	139,842	139,842	139,842	139,842	139,842

associates with higher market values than a percentage change in positive gross margin: A dollar of loss generates more market value of equity than a dollar of profit! For sales, neither positive nor negative gross margin has a significant effect on market value and for shares outstanding, companies with more negative gross margins have on average lower market values, which is consistent with theory, but companies with more positive gross margins also have on average lower market value, which is inconsistent with theory.

Comparison of Panel A and Panel B shows that across specifications the results are more stable in Panel A than in Panel B: For all specifications that use the transformation approach negative and positive gross margin is positively priced, where the effect is stronger for positive gross margin and the size proxy is significant and positive. These main findings do not depend on the choice of the size proxy. This behavior would be expected if all specifications tried to operationalize a similar theoretical construct: The explanation of economic value generation by accounting numbers.

Why is negative gross margin positively priced in the specifications that are summarized in Table 2.1? One possible reason is the inability of the size proxies to precisely measure the theoretical construct. For example, if book value of total assets alone proxies for replacement costs of total assets then effects of conservative accounting and intangible assets are ignored. High intangible assets would allow a company to incur high negative gross margins. Thus, without a proper control for intangible assets negative gross margin must be positively correlated with market value; Hand (2003) and Darrough and Ye (2007) find some evidence for this explanation. Similarly, if the research design posits that book value of equity is scale than effects of conservative accounting and intangible assets are not controlled for and negative gross margin is positively correlated with market value. If the effect of conservatism and the effect of intangible assets changes slowly from year to year then a significant part of their joint effect on market value should already be contained in last year's market value. Therefore, in corroboration of the argument that intangible assets and conservatism cause the positive pricing of negative gross margin, in the specification where scale is last year's market value negative gross margin is not

priced.

2.3.2 The pricing of depreciation expense

The second application tests how depreciation expense relates to market value. In one view depreciation is irrelevant for equity valuation because it is not a cash flow. This view is expressed in Christie (1987, p. 249):

> "When the dependent variable is value, then, cross-sectionally, virtually any levels variable has the potential to cause specification errors. An obvious example is accounting depreciation, which, at least within manufacturing firms, will tend to differ with the scale of the firm but will not have any economic explanatory power."

On the other hand, relative to size, high depreciation expenses could signal that the company operates with old assets that need replacement in the future. Replacements elicit capital expenditures, cash outflows, that reduce the value of the company ceteris paribus. High depreciation could also signal that management is careless in managing the assets of the company. No matter which view one adopts, depreciation should not positively relate to firm value. An econometric specification that produced a positive pricing of depreciation would be suspect of not controlling for size properly. The following specification tests the ability of the transformation approach to mitigate scale effects:

$$\begin{aligned} \mathrm{MVE}^{\dagger}_{i,t} = {} & a_0 + a_1 \mathrm{DP} + a_2 \mathrm{EBITDA}^{\dagger}_{i,t} \times \mathrm{LOSS}_{i,t} + a_3 \mathrm{EBITDA}^{\dagger}_{i,t} \times (1 - \mathrm{LOSS}_{i,t}) \\ & + a_4 \mathrm{S}^{\dagger}_{i,t} + \mathrm{Time}_t + \mathrm{LOSS}_{i,t} + \mathrm{Firm}_i + \kappa_{i,t} \end{aligned} \tag{2.5}$$

for firm i at time t. $\mathrm{y}^{\dagger} = \mathrm{asinh}(y)$, DP is depreciation and amortization expense, EBITDA is earnings before interest, taxes, depreciation and amortization and LOSS is 1 if EBITDA < 0

and 0 otherwise. The specification of the traditional approach that divides by a size proxy is:

$$\frac{\text{MVE}}{\text{S}}_{i,t} = b_0 + b_1\text{DP} + b_2\frac{\text{EBITDA}}{\text{S}}_{i,t} \times \text{LOSS}_{i,t} + b_3\frac{\text{EBITDA}}{\text{S}}_{i,t} \times (1 - \text{LOSS}_{i,t}) + b_4\frac{\text{BVE}}{\text{S}}_{i,t} + \text{Time}_t + \text{LOSS}_{i,t} + \text{Firm}_i + \phi_{i,t} \tag{2.6}$$

Panel A of Table 2.2 contains coefficient estimates for the transformation approach and Panel B contains coefficient estimates for the regressions that divide by a size proxy. The sample is North American manufacturing companies from COMPUSTAT.[10] As is evident from Panel A, in the absence of a size proxy depreciation is positively associated with market value; depreciation is the size proxy in this setting. In contrast, in the remaining specifications in Panel A, that include a size proxy, depreciation is either negatively related to market value or not related at all (for lagged total assets). These negative or insignificant coefficients are consistent with the argument above that depreciation expense signals future capital expenditures that have a negative effect on market value. The coefficients on the other variables are also consistent with expectations: negative EBITDA has a smaller effect on market value than positive EBITDA and all size proxies have a positive coefficient.

In contrast, the coefficient estimate on depreciation for some of the specifications in Panel B is positive. In particular, the specifications that divide the regression variables by sales, book value of equity or lagged market value produce a significant positive coefficient on depreciation. The other specifications yield the negative or insignificant coefficient that is consistent with theory. In some specifications the coefficient estimates are unintuitive. Specifically, in the specification that divides by sales only depreciation and book value of equity are significantly associated with market value; EBITDA is not associated with market value. In the specification that divides by lagged market value, market value tends to be higher for companies with larger negative EBITDA but market value is not associated with positive EBITDA.

[10] To be included in the sample, the first digit of companies' SIC code has to be equal to 2 or 3 and all size proxies must be positive. Market value is CRSP share price multiplied by shares outstanding six month after financial year end. Standard errors are clustered by firm and year.

Table 2.2: Regressions of market value on depreciation for different size proxies and different methods that mitigate scale effects

This table contains coefficient estimates and their standard errors for regressions of market value on depreciaiton, EBITDA and size proxies. In *Panel A* all variables are transformed by the inverse hyperbolic sine. In *Panel B* all variables are divided by the size proxy indicated in the row labelled "Scale". All regressions include firm and year fixed effects and different intercepts for companies that have negative EBITDA and positive EBITDA. Standard errors are clustered by firm and year. The adjusted R^2_{adj} measures the percent of remaining variation that is explained by the regression variables after the fixed effects on market value are partialled out. Significance codes: $\bullet \sim 10$ %, $^{*} \sim 5$ %, $^{**} \sim 1$ % , $^{***} \sim < 1$ %

Panel A: Additive control for size (transformation approach)

Variable	Dependent variable: MVE						
DP	0.129***	0.014	-0.119***	-0.262***	-0.050*	-0.067**	-0.055***
	(0.025)	(0.021)	(0.022)	(0.025)	(0.024)	(0.025)	(0.015)
EBITDA×	-0.158***	-0.141***	-0.113***	-0.096***	-0.180***	-0.099***	-0.020
LOSS	(0.018)	(0.018)	(0.017)	(0.017)	(0.017)	(0.017)	(0.013)
EBITDA×	0.456***	0.440***	0.337***	0.343***	0.410***	0.373***	0.189***
$(1-\text{LOSS})$	(0.020)	(0.020)	(0.017)	(0.019)	(0.020)	(0.017)	(0.010)
TA_{t-1}		0.159***					
		(0.040)					
BVE			0.481***				
			(0.020)				
TA				0.630***			
				(0.032)			
SAL					0.292***		
					(0.022)		
SHROUT						0.657***	
						(0.033)	
MVE_{t-1}							0.599***
							(0.020)
R^2_{adj}	22.9 %	23.4 %	33.6 %	30.9 %	25.2 %	34.8 %	46.3 %
N	40,109	40,109	40,109	40,109	40,109	40,109	40,109

Table 2.2: Continued

Panel B: Division by size (traditional approach)

	Dependent variable:					
Variable	MVE	MVE	MVE	MVE	MVE	MVE
DP	-3,552.6***	-553.9	3,033.1**	59,280.6*	13,292.9***	-7,188.1***
	(1,036.3)	(6,741.3)	(1,142.4)	(26,499.6)	(1,156.8)	(1,880.9)
EBITDA×	-3,060.6***	-9,205.8*	-1,189.1***	2,182.9	-7,484.2***	-1,005.5•
LOSS	(386.6)	(3,911.7)	(306.1)	(1,549.8)	(1,500.5)	(520.0)
EBITDA×	7,057.5***	7,825.1***	254.4	-32,161.8	4,636.3***	3,350.5***
$(1-\text{LOSS})$	(424.3)	(1,209.5)	(330.1)	(19,856.5)	(572.6)	(807.2)
BVE	1,001.0***	3,321.1***	328.4***	2,073.3***		1,019.2***
	(214.5)	(521.7)	(63.0)	(231.0)		(154.4)
Scale	TA	TA_{t-1}	MVE_{t-1}	SAL	BVE	SHROUT
R^2_{adj}	5.6 %	27.1 %	28.5 %	69.4 %	90.0 %	54.4 %
N	40,109	40,109	40,109	40,109	40,109	40,109

Overall, the observations in this section are similar to the previous section: In contrast to the traditional approach, the findings for the transformation approach are robust to the size proxy that is used. This observation is consistent with the assumption that all specifications that employ the transformation approach measure a similar theoretical construct independent of the size proxy that is employed.

In summary, the applications demonstrate that the transformation approach yields results that are consistent with theory whereas some specifications that employ the traditional approach of dividing the regression variables by a size proxy yield unintuitive results. Moreover, the transformation approach generally yields results that do not qualitatively depend on the size proxy that is employed; coefficients have the same sign. In contrast, the insights from the traditional approach depend on the size proxy. One concern is that extreme observations drive these conclusions. Therefore, I follow the common practice and winsorize all scaled regression variables by 3 % from below and above. The results improve for the traditional specifications, neverthe-

less, the main conclusions stay the same.[11] Another concern is that, following convention, the specifications that divide regression variables by a size proxy include book value of equity as an additional variable. Therefore, these regressions contain more information than their equivalent in the transformation approach. The exclusion of book value of equity does not change the qualitative findings of this section, however.

2.4 Tests for lack of fit and deviation from homoskedasticity

The analysis in this section is in the spirit of Easton and Sommers (2003) who analyse the lack of fit and non-constancy of the error variance that is caused by the presence of size. Lack of fit indicates deviations from the linear functional form of the regression equation or the omission of variables that explain market value. In general, in the presence of lack of fit or omitted variables, coefficient estimates in the regression are biased and inconsistent. Non-constancy of the error variance indicates that some observations contain more information about the underlying relationship between market value and accounting numbers and therefore should be weighted heavier in the regression. In consequence, ordinary least squares estimation, which weights observations equally, does not employ the full information in the sample and will thus lose its power to detect dependencies in the sample.

The analysis of the lack of fit and the non-constancy of the error variance yields the following results: The model that divides by lagged market capitalization and the model that transforms all variables by the *asinh* outperform the other models in terms of goodness of fit and deviation from constancy of the error variance. Nevertheless, both models show systematic deviations from the ideal case where all regression variables are multivariate normal.

Similar to prior studies (Barth and Kallapur, 1996; Easton and Sommers, 2003; Barth and

[11] In particular, in both applications losses (negative GM or negative EBITDA) and profits (positive GM or EBITDA) are now positively priced; except in the application that scales by total shares outstanding where losses are not priced. In the first application, negative gross margin remains to have a much larger effect on market value than positive gross margin. In the second application, the coefficient on depreciation is positive for the specifications that scale by book value of equity and lagged total assets and negative for the remaining specifications.

Clinch, 2009), I test the following specifications for lack of fit and monotone spread:

$$\mathrm{MVE}_i^{\dagger} = \psi_0 + \psi_1 \mathrm{EARN}_i^{\dagger} \times \mathrm{L}_i + \psi_2 \mathrm{EARN}_i^{\dagger} \times (1 - \mathrm{L}_i) + \psi_3 \mathrm{BVE}_i^{\dagger} + \mathrm{L}_i + e_i \qquad (2.7)$$

where $\mathrm{L}_i = 1$ if $\mathrm{EARN}_i < 0$ and zero otherwise. The corresponding formulation for the approach that divides all regression variables by a size proxy is:

$$\frac{\mathrm{MVE}}{\mathrm{S}}_i = \omega_0 + \omega_1 \frac{\mathrm{EARN}}{\mathrm{S}}_i \times \mathrm{L}_i + \omega_2 \frac{\mathrm{EARN}}{\mathrm{S}}_i \times (1 - \mathrm{L}_i) + \omega_3 \frac{\mathrm{BVE}}{\mathrm{S}}_i + \mathrm{L}_i + f_i \qquad (2.8)$$

where S is one of the size proxies of the prior sections. This specification is often used to test the incremental explanatory power of other items from the financial statement. Researchers motivate this specification with the models of Ohlson (1995) and Feltham and Ohlson (1995) that supply a valuation function that is linear in earnings and book in a company's value of equity.[12] The estimates from these specifications are from yearly cross section of North American companies from 1963 until 2009.[13]

Figures 2.4 and 2.5 show the distribution of annual standardized mean residuals for market value deciles. Specifically, in each year the residuals are assigned to market value deciles. For each decile the mean residual is divided by the standard deviation of residuals and multiplied by the square root of the number of observations. Figures 2.4 and 2.5 depict boxplots of the t-statistic generated in this way for the years 1963 until 2009 for all specifications. Clearly visible from Figure 2.4, which is drawn on the same scale for all models, is a large variation of t-statistics across models. For the models that divide the regression variables by book value of equity (book value), shares outstanding (shares), lagged assets (lagged assets), total assets (assets) or sales (sales), deviations of 10 standard deviations from the mean in some years are not uncommon. Division by sales or lagged total assets can even produce errors that are 100

[12]The choice of the size proxy in the transformation approach is unclear. Book value of equity has arguably the strongest resemblance to the (Ohlson, 1995) model and therefore enters the specification above. In unreported analysis I find, however, that proxying size by lagged market capitalization yields a better specified model.

[13]The construction of the sample and the selection requirements are the same as in the previous sections. Earnings are earnings before extraordinary items. The qualitative results in this section are robust to winsorizing all variables by 3% from below and above.

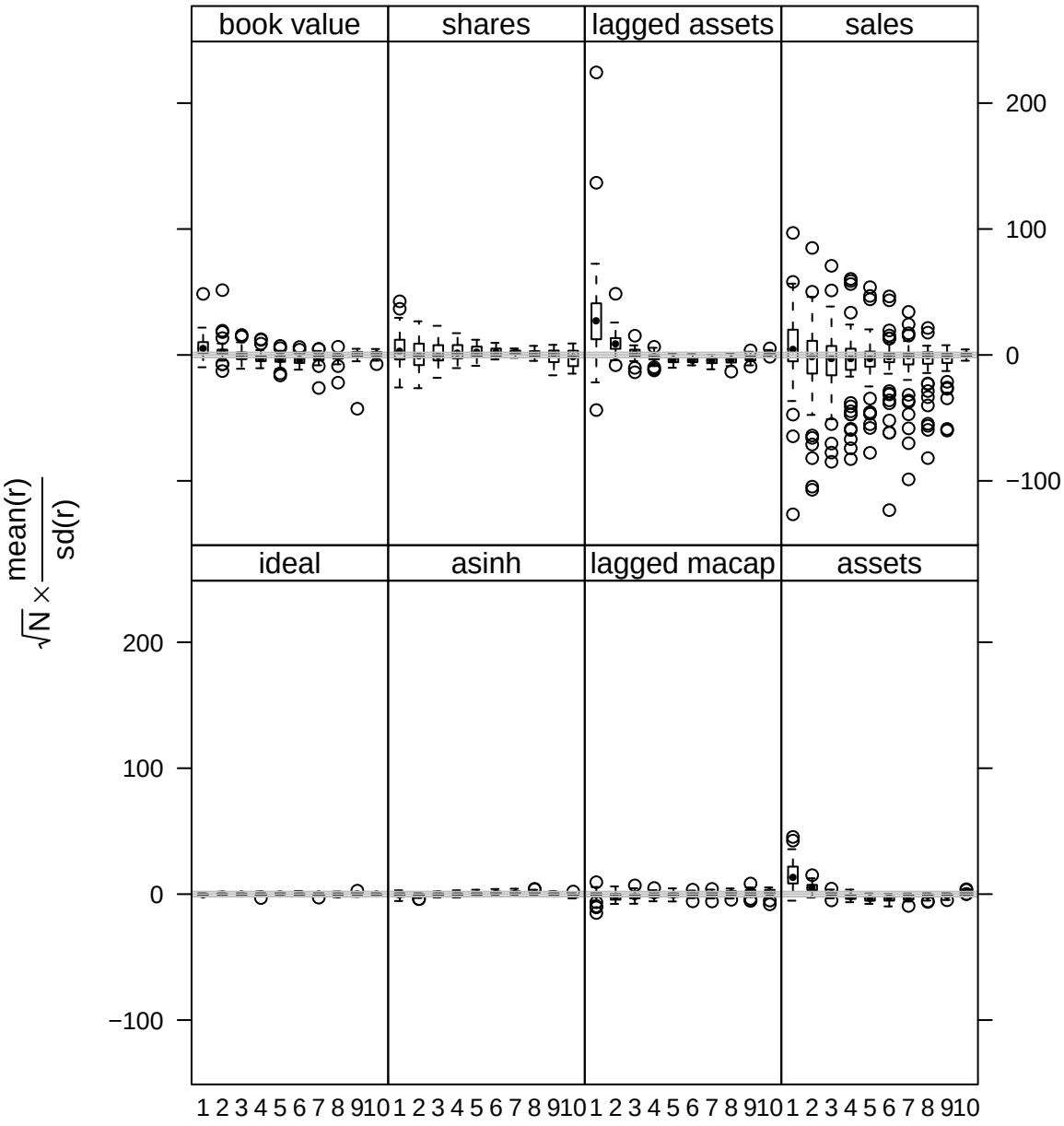


Figure 2.4: Lack of fit for regressions of market value on earnings before extraordinary items and book value – same scale

This figure shows lack of fit for annual regressions of market value on earnings and book value. For each model, labelled in the top of each panel, and every year the residuals are sorted into market value deciles; the groups corresponding to the deciles are depicted on the x axis. For each decile the mean of residuals is divided by the standard deviation in the decile and multiplied by the square root of observations in the decile. This statistic is the value of the y-axis. The distribution of this statistic over the years 1963 until 2009 is depicted in box plots for all models. The grey lines are a 95 % confidence interval if the statistic is zero and independently distributed over the years. The panel labelled "ideal" is the distribution of the statistic for simulated normal variables. All panels are drawn on the same scale.

standard deviations from the mean. On the other hand, the model that scales by lagged market value (lagged macap) and asinh (asinh), the transformed model, have boxplots that are barely distinguishable from the two grey lines that is a 5 % confidence interval if the t-statistics is zero and independent across the years.

To explore the lack of fit further, Figure 2.5 depicts the t-statistics on different scales. The panel in the bottom left, which is labelled "ideal", depicts the t-statistics when the regression variables are multivariate normal and hence, when OLS is the best estimator. As would be expected in this setting, across market value deciles, the standardized residuals are nearly zero, the distribution in each decile is symmetric and t-statistics are seldom out of the confidence interval. In contrast, for the asinh model, for more than 25 % of the years the t-statistic is out of the confidence interval in deciles 1, 6, 7 and 10. In the extreme deciles 1 and 10 the model tends to underestimate market value and in deciles 6 and 7 the model overestimates market value. Except for the model that scales by lagged market value the other models perform much worse. For the model that scales by total assets, in three deciles and for the model that scales by book value, in two deciles, more than 75 % of t-statistics are out of the confidence interval. For these and the models that use sales, shares outstanding and lagged assets it is not uncommon to find t-statistics out of the confidence interval in 50 % of the years. Most of the models have the largest residuals for companies with the smallest market capitalization. This observation points to the omission of variables from the models that are important in valuing small companies.

Turning to the non-constancy of the residual variance of the models, Figure 2.6, shows the distribution of mean absolute studentized residuals for market value deciles for the years 1963 until 2009. The design of this figure is similar to the setup of Figure 2.4 . Instead of averaging over t-statistics for each model, in each market value decile in each year, however, in Figure 2.6 absolute studentized residuals are averaged. In addition, the square root transforms these absolute studentized residuals to make the distribution of the residuals more symmetric. The multivariate normal setting, that is labelled "ideal" in the bottom left panel, demonstrates that when OLS is the best predictor, the absolute studentized residuals are constant across mar-

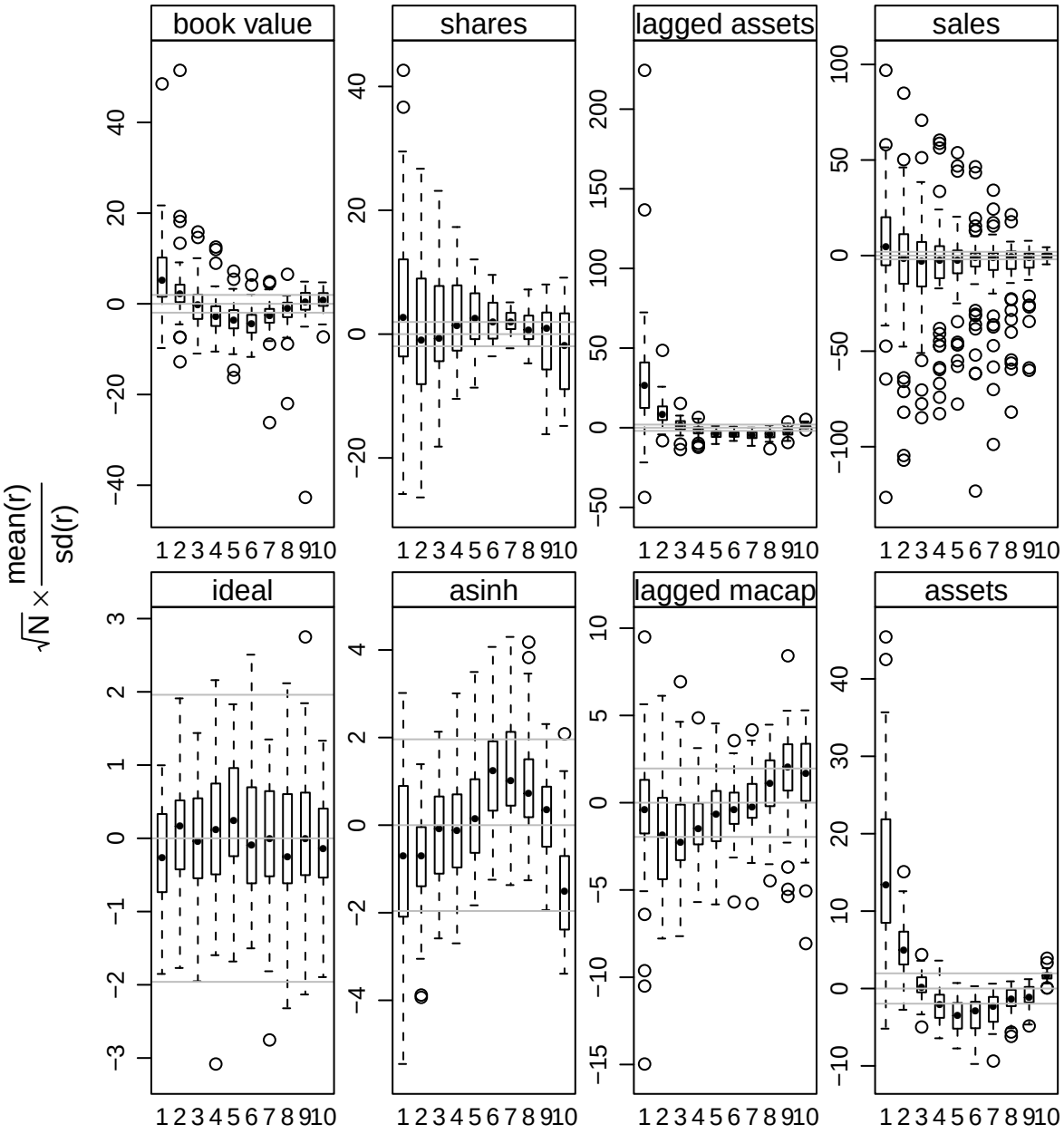


Figure 2.5: Lack of fit for regressions of market value on earnings before extraordinary items and book value – varying scale

This figure is the same as Figure 2.4, however, in this figure the scale of the t-statistic varies from panel to panel.

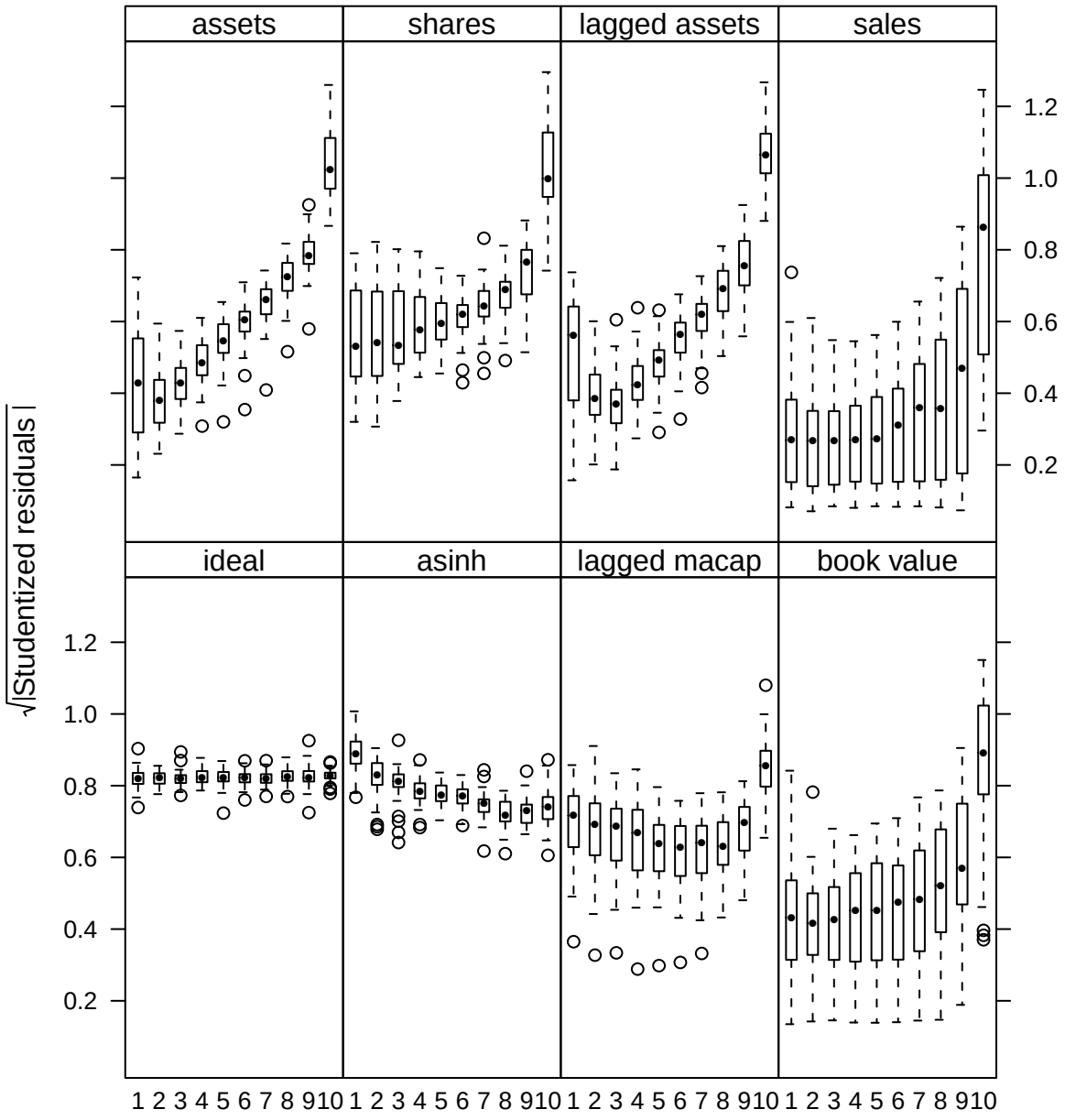


Figure 2.6: Deviation from homoskedasticity for regressions of market value on earnings before extraordinary items and book value

This figure shows deviations from homoskedasticity for annual regressions of market value on earnings and book value. For each model, labelled in the top of each panel, and every year, the residuals are sorted into market value deciles; the groups corresponding to the deciles are depicted on the x axis. For each decile the mean of the square root of absolute studentized residuals is depicted on the y-axis. The distribution of this statistic over the years 1963 until 2009 is depicted in box plots for all models. The panel labelled "ideal" is the distribution of the statistic for simulated normal variables. All panels are drawn on the same scale.

ket value deciles at an average value of about 0.8. The sampling variation is modest with an interquartile range of about 0.2. This constancy is contrasted with the specifications that are estimated with real data. All models that divide the regression variables by a size proxy have the highest residual variance in the highest market value decile. Except for the model that scales by lagged market value, the models have a tendency to produce monotone spread, i.e. the increase of the residual variance to increase with market value. In consequence, OLS will weigh high market value firms more than is warranted by their overall contribution to the information of the relationship between market value earnings and book value of equity. This weighting is not only inefficient but potentially misleading because there is lack of fit in the most extreme market value deciles as Figures 2.4 and 2.5 demonstrate. Thus, OLS will exacerbate the lack of fit. The model that transforms all variables by the *asinh* neither has constant residual variance. Compared to the other specifications, the residual variance of the asinh model decreases with market value. Hence, OLS will underweight companies with larger market value. Although traditional tests would reject homoskedasticity for all models, it is evident from Figure 2.6 that the deviation from constant error variance is much smaller for the asinh model on average. Moreover, the variation of the residual variance across the years is smaller for the asinh model, demonstrating that large deviations from homoskedasticity are uncommon.

So far the specifications have only been tested within sample. Without testing the specifications out of sample, it is possible that the models pick up spurious relationships that do not hold in other settings. Since, under US GAAP financials statements should be consistent, i.e. comparable across time, a natural choice for testing the model in a different setting is the next financial year. Therefore, if the specification picks up a spurious relationship between market value and earnings in the current financial year it should have a poor performance in the next financial year. In particular, I estimate the specifications in the current year and, based on these fitted models, make a prediction of market value with accounting data from the next year. Table 2.3 reports summary statistics for absolute relative prediction errors for the predictions generated in this way.

Table 2.3: Summary statistics of out of sample absolute pricing errors

This table contains summary statistics for absolute pricing errors. Errors are the relative absolute difference between market value and a forecast of market value that is based on this year's earnings before extraordinary items, book value of equity and size proxy but on last year's model fit. The generation of errors in this way starts in 1963 and ends in 2008. Q25 is the lower quartile, Q50 is the median, AVG is the mean, Q75 is the upper quartile, $\sqrt{\text{MSE}}$ is the mean squared error, N is the number of observations and N < 0 is the number of observations that provide a negative forecast.

	Q25	Q50	AVG	Q75	$\sqrt{\text{MSE}}$	N	N(<0)
asinh	0.194	0.406	0.649	0.691	1.926	139,035	0
TA	0.260	0.577	1.147	1.181	3.956	139,035	7,928
TA_{t-1}	0.294	0.675	1.610	1.518	5.639	139,035	13,928
MVE_{t-1}	0.102	0.194	0.251	0.328	0.675	139,035	20
SAL	0.505	1.340	4.235	3.751	15.237	139,035	19,727
BVE	0.263	0.578	1.102	1.142	4.751	139,035	2,746
SHROUT	0.225	0.495	1.052	1.012	3.170	139,035	6,968
LOESS	0.178	0.378	0.642	0.659	3.970	139,035	0
MVE	0.125	0.280	0.466	0.531	1.192	139,035	0

Among the specifications, the specification that transforms by the *asinh* has the second smallest root mean squared error ($\sqrt{\text{MSE}}$), even though it uses the least information (together with the model that scales by book value of equity); the asinh model does not include the additional size proxies that the other models use. A comparison of the specification that divides by book value of equity demonstrates that the root mean squared errors can be reduced by about 60 % by simply combining the available information differently. Overall, the specification that scales by lagged market value has the smallest root mean squared error. Contrasting this outperformance against the prediction that next year's market value is this year's market value, reported in the bottom row of Table 2.3, suggests that some of the outperformance is driven by the inclusion of the additional information in last years market value used by the model that scales by lagged market value. The last column of Table 2.3 contains the number of predictions that predict a negative market value. For the specifications that scale by lagged assets or sales more than 10 % of market value predictions are negative. Again, the asinh specification and the specification that scales by lagged market capitalization perform better with respect to this

dimension; the *asinh* never produces a negative forecast and the specification that scales by lagged market value produces 20 negative forecasts.

Easton and Sommers (2003) note that the presence of scale causes nonlinearites between market value and earnings. If nonlinearities are persistent then a nonparametric fit should pick these up and outperform the asinh specification. The row labelled "LOESS" depicts a summary of the absolute percentage error of a locally weighted regression (Das and Lev, 1994; Cleveland et al., 1988) of the *asinh* of market value on the *asinh* of earnings and the *asinh* of book value of equity. The summary statistics of the prediction errors, which are not too different from the asinh specification, demonstrate that the assumed linear model is a reasonable first approximation.

2.5 Conclusion & Discussion

This paper proposes to use transformations by the inverse hyperbolic sine (*asinh*) to overcome impediments to inference that are caused by difference in scale in a cross section of companies. Instead of "canceling out" size from variables by division by a size proxy, the predominant approach in the accounting literature, the *asinh* transformation turns the multiplicative scale effect into an additive effect; the problem of scale becomes the problem of controlling for an omitted variable. The method employed in this paper can therefore draw on a large number of prior contributions whose aim is to mitigate omitted variable bias.

The tests of the paper demonstrate that the proposed approach yields more intuitive results economically than the traditional approach that scales the variables by a size proxy. In addition, the proposed approach has among the best out of sample performance, least deviation from heteroskedasticity and least lack of fit. Since the approach of the paper is to use the same information used by traditional approaches, results are driven by a better combination of the available information. While the choice of size proxy varies over applications, depending on what economic construct is to be explained, the size proxy , lagged market value, yields the

least "surprising" results in the applications of this paper.

The proposed transformation approach relates accounting variables to the *asinh* of market value. This focus on the *asinh* is warranted if the research interest lies in the elasticity between the size corrected economic construct (e.g. Tobin's q) and size corrected accounting numbers. The approach is biased, however, if the interest is in market value because $E[\text{MVE}] \neq \sinh(E[\text{asinh}(\text{MBE}])$. Therefore, if the focus is on forecasting market value, depending on the bias of the transformation approach, a different approach might be more fruitful. One way is to deviate from the assumption of a normal error and instead introduce a distribution that is more consistent with the data, such as the Gamma distribution, that has only positive support (like market values) and scales proportionally with its value.[14] Procedures to fit this generalized linear model are well researched (McCullagh and Nelder, 1989) and available in most statistical packages. Inferential methods that are known from standard linear models are also applicable for generalized linear models.

[14]The behavior of the variance of the Gamma distribution is consistent with Easton and Sommers (2003)'s claim that "scale is market capitalization".

Chapter 3

Value creation and value destruction in the Societas Europaea: Evidence from the new legal form

The main purpose of the paper is to provide early evidence on the value of the Societas Europaea (SE) to shareholders. The SE is a recent legal form that is partly based on European Union (EU) law. The SE came into existence in 2001 to allow publicly-limited companies greater cross border mobility within the EU, to freely contract their worker's involvement in the company, to decide between a two-tier (i.e. supervisory board and management board) or one-tier (i.e. board of directors) board structure and to easily relocate within the EU. Prior to the SE these actions were either costly or legally impossible.

This paper is the first that relates SE announcement returns to corporate governance changes that follow SE adoption. The paper thus contributes to a recent report commissioned by the European Commission (Ernst & Young, 2009) that evaluates the SE's success based on survey data and number of registrations. The paper also complements an earlier study of Eidenmüller et al. (2010) that studies SE announcement returns.

The paper uses two different samples. First, the paper links announcement returns of 47

companies that want to become SEs to information in their merger / conversion reports. Second, the paper studies the return on assets of 48 listed and non-listed SEs before and after they become SEs.

The three main findings are: First, listed SEs that change their board structure from two-tier to one-tier have 3.7 percentage points lower abnormal announcement returns than SEs that keep the two-tier structure. The one-tier board manages the company whereas in the two-tier board the supervisory board may only supervise the management board. Therefore the one-tier board is better capable to benefit from the expertise of all its board members than the two-tier board. If the board's provision of expertise is valuable for shareholders then the documented drop in returns following the change in board structure must be attributed to the board's other role – its monitoring role. Unfortunately, the small sample size prevents me from a meaningful analysis of the factors that explain the board's weakened monitoring role.

Second, listed SEs that operate in the online gambling or renewable energy industries have on average 2.5 percentage points higher abnormal returns than listed SEs operating in other industries. The finding conforms to the hypothesis that the SE's ability to (credibly threat to) relocate is more valuable to companies that critically rely on special legislation to do business. Some EU countries have recently banned or are reviewing their laws for private online gambling service providers. The SEs in the renewable energy industry, all of them German, critically depend on subsidies that make the production of "green energy" profitable. These tax subsidies will expire in the future. Therefore, relocation to countries with higher subsidies might be beneficial for these companies. Even if they do not relocate, the credible threat of relocation increases their lobbying power with the government.

Third, while I do not find significant changes of return on assets after listed and non-listed companies become SEs I document that SEs are already underperforming their industry peers before they become SEs.

I do not find any significant unconditional announcement returns. Moreover, I do not find significant evidence for all my hypotheses concerning worker involvement in the company.

Specifically, companies in Germany, the country with the highest degree of worker involvement, do not have significantly different announcement returns than companies in other countries. German companies with different worker participation laws do not have different announcement returns. Last, companies with a less concentrated European work force do not have higher abnormal returns. This finding is inconsistent with the hypothesis that the participation of a more diverse work force impairs worker's voice in the company affairs to the benefit of shareholders.

The paper contributes to the literature that establishes a link between board characteristics and shareholder value (e.g. Yermack, 1996; Cotter et al., 1997; Fich and Shivdasani, 2006; Hwang and Kim, 2009). Because of the simultaneity between performance metrics and the selection of board members many studies can be criticized for their problems to establish stronger causal links between board characteristics and performance. In contrast, this paper, using board structure changes that are exogenous to announcement returns, provides a stronger causal link between board structure and performance. Due to its small sample size the paper can only analyse differences between two-tier and one-tier boards and cannot dissect what factors in the board could explain weaker monitoring. The paper complements recent literature that uses exogenous shocks to identify value effects of the board (Ahern and Dittmar, 2010).

The remainder of the paper provides a short overview of the main benefits of the SE in Section 3.1 and develops hypotheses in Section 3.2. Section 3.3 describes the sample and its selection, Section 3.4 presents evidence on the hypotheses and Section 3.5 concludes.

3.1 The Societas Europaea: What makes it different?

The Societas Europaea (SE) is a legal form that was created by EU law in 2004.[1] The SE is a public limited liability company with share capital. The unique feature of the SE is that it is partly governed by EU law. This feature enables the SE to have legal personality in all member states of the European Union (EU) and the European Economic Area (EEA). The feature also

[1] The EU law is Council Regulation No 2157/2001 and Council Directive 2001/86/EC.

vests the SE with rights national public limited liability companies do not have. In particular the SE can

- change its seat (a company's central place of administration) within the EU and the EEA without being forced in dissolution
- undertake cross border mergers
- choose among board structures (one-tier: board of directors or two-tier: management board & supervisory board)
- sidestep national worker involvement laws by concluding its own agreement with its employees

The SE can be formed in four ways – conversion, merger, creation of a holding company or creation of a subsidiary. In a conversion an already existing public limited company changes its legal status to a SE. In a merger two publicly limited companies from different member states either merge to become a new firm or one company absorbs the other. Public or private limited companies from different member states render their shares to a holding company that is an SE. In this way they create a holding SE. Finally, companies with cross border activity can form a subsidiary SE.

I discuss the advantages of the SE in turn:

Change of seat Prior to the SE it was impossible or difficult to relocate to other member states. Relocation is a change of a company's headquarters and/or of the place where the company is registered. Often member states penalize a relocation of a company's head office to another member state by liquidation or its non recognition in the host state (Storm, 2006). In most member states a company can only relocate its registered office by liquidating the company in its current member state and subsequently form a new entity in the new member state. This process is costly as hidden reserves are taxed and the change

from one legal form and system to another causes legal uncertainty. Subject to the approval of the general meeting and the requirement that head and registered office are in the same place, SEs do not change legal personality when they relocate. Hence SEs do not incur the costs national public limited liability companies have to bear upon relocation.

Cross border mergers Before the SE, it was impossible or difficult for companies to merge with companies in other member states. In most countries the acquirer had to purchase all of the shares of the target and then integrate the target's assets into its operation or form a new company with its own assets and that of the target. Possible taxes, the creation of a new legal person and the possibility of minority shareholders to hold up the transactions necessary to carry out the merger made mergers costly and risky. To highlight the complexity of cross border mergers before the SE came into existence the merger between German Hoechst AG and French Rhône-Poulenc S.A. in 1999 is instructive.[2]

The companies want to effect a cross border merger between equals to become the new pharmaceutical company Aventis. Both companies are holding companies that own stakes in other companies in the pharmaceutical industry. The final deal that both parties agreed on looks like this: Rhône-Poulenc first makes a bid to the shareholders of Hoechst AG. If more than 90 % of Hoechst shareholders render their shares, Rhône-Poulenc will compensate them with its newly issued shares. After that Rhône-Poulenc will change its statutes, transfer its seat to Strasbourg (from Paris) and will adopt a two-tier board structure. There will be parity amongst the German and French members on the management board. The merged company will be called Aventis.

The structure Hoechst and Rhône-Poulenc choose has drawbacks. Hoechst will be an intermediate holding company within Aventis with no apparent purpose. In the likely event that not all the shareholders render their shares, minority shareholders remain in Hoechst. These shareholders have special rights because the newly formed Aventis will dominate Hoechst. They have the power to hold up and sue Aventis. Hold up and shareholder

[2]Popular transactions that effect a cross border merger are described in Stengel (2002).

litigation will be likely when Aventis tries to integrate business units of Hoechst as part of its restructuring plan. In addition, Hoechst has to keep complying with the disclosure requirements of a public company. It is therefore not surprising that one clause in the merger agreement states that Aventis converts into a SE once the law is available.[3]

Hoffmann (1999) discusses alternatives to the deal and makes clear why a simpler structure of the deal was not possible. A direct merger between the companies is not possible as the German law only regulates domestic mergers. Hoechst AG could incorporate in France and then merge with Rhône-Poulenc under French law. However, according to French and German law it is only possible to incorporate in another country if the seat of a company is changed simultaneously. Yet a change of seat would be impossible without the dissolution of the company.[4] Both companies could have transferred their assets and liabilities to a new company in France and receive shares in the new company when Hoechst and Rhône-Poulenc are liquidated. The necessary agreement of all of Hoechst's creditors makes this alternative risky. The liquidation would also lead to taxation of hidden reserves at the new company level and to capital tax for the new shares at the shareholder level. Abstaining from the liquidation would not result in the desired single share structure. It would also create a pyramid structure that would give Hoechst shareholders – who would hold 53 % in the new company – control rights that are disproportionate to their cash flow rights. Thus, this alternative would not effect the desired merger between equals.

If the SE had been available Aventis could have been formed directly by the combination of Hoechst's and Rhône's assets subject to the approval of both companies' shareholders in the General Meeting. There would be no risk that minority shareholders of Hoechst or Rhône remain in Aventis as the two companies would cease to exist. Aventis SE could easily locate in any of the EAA or EU member states and decide upon its board structure.

[3] Curiously, it was possible for Chrysler – a non EU company – and German Daimler in 1999 to merge and have a single shareholder structure (Baums, 1999).

[4] Germany and France follow the "real seat theory" which requires a company to have its seat and place of registration at the same location.

Choice of board structure In many countries in the EU, public limited liability companies cannot choose whether the company is represented by a board of directors (one-tier system) or a management board and a supervisory board (two-tier system). The SE enables the general meeting to decide upon the board structure.

Free negotiation of worker involvement Worker involvement is mandatory in many EU countries. In some EU countries employees must be represented on the board of directors or the supervisory board. Often the laws for worker involvement are rigid. In Germany, for example, public limited-liability companies with more than $20,000$ employees must have 20 supervisory board members of which 10 are employee representatives. These representatives represent the interest of the workers in the country where participation laws are enforced (in the example above Germany). In contrast, the SE allows for a flexible form of worker involvement. Upon formation of an SE the management negotiates with its EU / EEA employees how they are going to be involved in the SE. Involvement consists of information, consultation and participation. Information is the timely supply of information about the SE and its subsidiaries to the employees. Consultation gives employees the right to establish a dialogue with and express their opinion before the management of the SE. Participation comprises the right to elect or appoint some of the members of the supervisory board / board of directors or to oppose or recommend some or all of the members of the supervisory board / board of directors. How much involvement employees can demand depends on the level of involvement that was present before the company adopted the SE. In contrast to the provisions in national laws, all employees of the company or its representatives within the EU / EEA participate in negotiations about worker involvement. Negotiations are between the Special Negotiating Body (SNB) and the management of the company. The SNB is presented by employees from all EU countries in which the company has employees. The more of the company's employees work in a country the more seats the country gets in the SNB. Decisions within the SNB are reached with a double majority – at least half of the workforce that represents at least half

of the countries.

Since 15 December 2007, when the Cross Border Directive[5] had to be transposed into law, European limited liability companies do not need the SE to effect cross border mergers anymore. Instead, limited liability companies can merge without change in legal form subject to similar requirements regarding worker involvement as the SE. Therefore, the SE might have lost some of its attraction.

In summary, SEs enjoy greater cross border mobility and are more flexible with respect to their corporate governance structure and worker involvement.

3.2 Hypotheses development

In this section I formulate 9 hypotheses. Except for the first hypothesis, all hypotheses link changes that the SE entails to shareholder value. On the one hand, managers can use the SE's advantages over existing domestic legal forms to generate value. But if managers do not act in the interest of shareholders they can use the SE to destroy value by weakening their monitoring and entrench themselves. Moreover, majority shareholders could destroy value by using the SE to their advantage at the cost of minority shareholders.

I expect that on average managers will use the SE to shareholder's advantage:

HYPOTHESIS 1:
Companies that become SEs experience positive abnormal returns around the announcement date.

Because transformation into a SE must be approved by shareholders, I hypothesize that on average companies will only become SEs if shareholders value this change in legal form. Moreover, if managers are incentivized to increase shareholder value by their compensation contracts (Kaplan, 1994; Jenter and Kanaan, 2008) they will only propose to change the legal form if it is beneficial for shareholders. How does the SE channel value?

First, the SE can generate value through cheaper cross border mergers. Although ordinary

[5] Directive 2005/56/EF from 26 October 2005.

companies can easily *acquire* another EU company, it is costly to integrate the company's operations into their existing business structures because minority shareholders of the acquired company can hold up the integration. But if companies *merge*, at least one company ceases to exist and thus there is no hold up. The SE offers cross border mergers if the majorities of the shareholders of all involved companies agree. In contrast, in order to prevent holdup by minority shareholders, an ordinary company must freeze out the remaining shareholders of the acquired firm, a costly process that is not available in all EU member states. In addition, the SE, through its European image, can overcome national sentiment that would otherwise prevent a cross border merger. For example, in the acquisition negotiations between German MAN and the Swedish Scania, the parties considered that the new company's headquarters should be located in a "neutral" country or that the new company should be a SE (Handelsblatt, 2007). Lenoir (2007) cites an estimate by the European Commission in 1995 that SE cross border reorganizations save 30 EUR billion annually.

Easier cross border reorganizations cannot only save costs but increase overall cross border activity because reorganizations that were too costly before the SE can now be profitable. More cross border mergers, however, can destroy value if managers build empires or acquire because of hubris. Hence, becoming an SE could decrease shareholder value if managers do not act in shareholder's interest. Recent European evidence is equivocal about the question whether cross border mergers create significant abnormal returns for the acquirer. Campa and Hernando (2004) find no significant returns. In contrast, Goergen and Renneboog (2004) find significant abnormal returns of up to 3.09 %.

Another possibility for the SE to generate value is its ability to change its seat. The SE can exploit the most favorable legal system within the EU and therefore choose the legislation that is best for shareholder value. For example Ahern and Dittmar (2010) provide evidence that Norwegian companies changed their domicile in response to mandatory quotas of women on corporate boards. Even in the absence of differences in legislation, the SE can benefit from externalities if it locates close to other companies or its customers (e.g. lower search costs for

recruitment, lower distance to customers).[6] Strauss-Kahn and Vives (2009) provide evidence that US headquarters relocate to areas that have both more employment and more headquarters in the relocating headquarter's industry than other areas.

On the other hand, relocation can also result in laws that are unfavorable for shareholders. For example, Bebchuk and Cohen (2003) find that US states that have antitakeover statutes attract more companies than states which do not have these statutes. The high shareholder majorities, however, that managers need for relocation makes it unlikely that companies will relocate to countries that have unfavorable shareholder laws. But relocation could still lead to conflicts of interest between majority and minority shareholders. These conflicts are mitigated by provisions in the SE regulation that protect minority shareholders and that most member states have introduced.[7]

Even, if a SE does not change its domicile immediately, its legal form puts it into a position to act swiftly if the legal environment in its home country changes unfavorably. The SE's credible threat to relocate increases its power to lobby the government for favorable laws. Therefore, the SE is more valuable for industries that owe their profitability to special legislation that is likely to change in the future. To highlight this point, consider this quotation from Solon SE's annual report (2008); Solon SE is a producer of photovoltaics that subsequently became a SE (p. 57):

> The solar industry is highly dependent on government subsidies, investors and lendors. Without subsidies, photovoltaics would not be profitable in most countries, particularly photovoltaics involving grid-connected systems. Therefore, a reduction or elimination of subsidies in the markets of relevance to SOLON could lead to a significant decline in sales.

This reasoning about relocation leads to the second hypothesis:

[6] Closeness to its customers was the reason Elcoteq put forward to change its domicile from Finland to Luxembourg. Tax reasons were the motive behind James Hardie's move from The Netherlands to Ireland.

[7] The SE regulation explicitly encourages member states to protect minority shareholders when a SE changes its seat (Council Regulation No 2157/2001 Article 8 No. 5).

HYPOTHESIS 2:
Companies that operate in industries regulated by laws that are likely to change unfavorably in the future experience higher abnormal returns around the announcement day than SEs that operate in other industries.

The SE can also change shareholder value through choice of its board structure, a choice that is not available in most European legislations. The SE can choose a board that consists of one board of directors that manages and monitors the company (one-tier structure) or of a management board that manages the company together with a supervisory board that monitors the management board (two-tier structure). The SE regulation rules that the board of directors in the one-tier board structure "shall manage the SE". In most EU countries the board of directors can elect "managing directors" that are "responsible for the day-to-day management" of the SE. SE legislation in the member states differs in the extent that "managing directors" may serve on the board of directors. For example in Germany, the majority of board members must not be "managing directors". In Austria no "managing director" may serve on the board. In the two-tier board structure no member of the management board must at the same time serve on the supervisory board. Thus, the two functions of the board, management and monitoring, are separated in the two-tier board structure while they are combined in the one-tier board structure. What board structure generates more shareholder value? In Adams and Ferreira's 2007 model, the optimal choice of board structure depends on the CEO's private benefits. If private benefits are high shareholders choose the dual board structure and if private benefits are low shareholders choose the one-tier board structure. In the model the board's collaboration with the CEO in management provides information for better monitoring. The CEO has private benefits and therefore dislikes being monitored but the CEO also benefits from the advise of the board. A more independent board would monitor the CEO stronger, but at the same time discourage the CEO from collaboration with the board, which could therefore weaken monitoring overall. Because of the separation between management and monitoring in the two-tier board structure, the supervisory board of the two-tier board structure can never exploit information from collaboration with the CEO. The one-tier board, however, cannot commit to neglect for monitoring the

information gleaned from collaboration. Therefore, if the CEO has high private benefits he will never collaborate with the board and therefore he will never get advise that is valuable to both him and the shareholders.

Adams and Ferreira's 2007 model implies that one-tier boards tend to have members that depend on the CEO whereas supervisory boards are always independent. Empirical studies document that shareholders value outside directors. Rosenstein and Wyatt (1990) document positive returns upon the appointment of an outside director and Nguyen and Nielsen (2010) document negative returns upon the sudden death of an outside director. Byrd and Hickman (1992) provides evidence that boards with more independent directors help make better acquisition decisions and Weisbach (1988) documents that CEOs that report to boards with more outside directors have a higher probability to be fired after bad performance. Core et al. (1999) documents that companies with a higher fraction of outside directors have higher market-to-book ratios.[8]

Since the factors that determine the choice of a board's composition could be correlated with shareholder value it is difficult to predict, based on the empirical studies, how a change in the board structure that follows SE adoption will affect shareholder value. For example, if the CEO's private benefits are low, her actions are better aligned with that of shareholders and therefore shareholder value is higher. At the same time, in Adams and Ferreira's 2007 model, shareholders choose a more independent board. Cross sectionally shareholder value and board independence are positively correlated, however, increasing board independence in each firm decreases shareholder value because shareholders choose board structure optimally (see Hermalin and Weisbach, 2003; Adams et al., 2010, for a discussion of this endogeneity problem).

Instead of the shareholders choosing the board members, management could choose board members. Shivdasani and Yermack (1999) provide evidence that CEOs can influence the selection process of board members. Board members that are selected by the CEO could act more in

[8]Hermalin and Weisbach (1991) do not find a significant relation between Tobin's q and fraction of outside directors.

the management's interest that can be opposed to the interest of shareholders. Hence, changes to the board could decrease shareholder value. On the other hand, SE adoption affords high shareholder majorities. Therefore also board changes following SE adoption are subject to high voting requirements. These high majorities can prevent board changes that are unfavorable to shareholders.

In the absence of a clear prediction of the effect on shareholder value of a change from the two-tier board structure to the one-tier board structure, I settle with the working hypothesis:

HYPOTHESIS 3:
Companies that change their management structure from two-tier to one-tier exhibit negative announcement returns.

The SE offers free contracting of labor relations that can alleviate the negative impact on performance of rigid labour laws (Gorton and Schmid, 2004). Among European countries, Germany's worker involvement laws are the most extensive. I hypothesize that:

HYPOTHESIS 4:
German companies exhibit higher abnormal returns than companies from other European Union / European Economic Area countries when they announce to become an SE.

A SE's worker involvement provisions are the outcome of contracting between the company's workers and its management. A contracting solution offers the opportunity to tailor an agreement to worker's and management's needs. Thus, the contracting solution might make both parties better off compared to a solution provided by rigid labour laws. Jensen and Meckling (1979) argue that a board that (partly) consists of workers should underperform companies that can choose the members of their boards freely. Otherwise, companies would voluntarily appoint workers on their boards. In line with this argument, Faleye et al. (2006) find that companies that are controlled through an equity stake of their workers have lower valuations.

HYPOTHESIS 5:
German SEs that reduce the supervisory board size exhibit positive abnormal returns.

Large supervisory board sizes that are imposed upon a company by law might not lead to an optimal trade off between coordination costs and the benefits of supervision. German worker involvement law rules that the supervisory board size has to increase once a company's German workforce reaches certain thresholds. For example, a German public company with more than

20,000 employees must have 20 supervisory board members.[9] In contrast, the General Meeting chooses the size of the supervisory board in a German SE.[10] Yermack (1996) and Coles et al. (2008) find that companies that have smaller boards perform better financially. However, companies in complex businesses profit from a larger board size whereas companies in simple businesses loose (Coles et al., 2008). As there is no a priori reason to believe that companies that become SEs operate in more complex / simple markets I hypothesize that a reduction in supervisory board size leads to an increase in shareholder wealth.

HYPOTHESIS 6:
The abnormal return from announcing to become a SE is greater for German companies ruled by the "Mitbestimmungsgesetz".

Among the different worker involvement laws in Germany the "Mitbestimmungsgesetz" is one of the strictest. It prescribes that half of the members of the supervisory board must be worker representatives. Gorton and Schmid (2004) find that companies ruled by "Mitbestimmungsgesetz" have lower valuations. Thus companies, ruled by this law should benefit more from becoming an SE.

HYPOTHESIS 7:
The less concentrated the European workers of a company the higher are the abnormal returns it experiences upon announcement to become a SE.

Even though there are European trade union bodies, there is some anecdotal evidence that trade unions are still national bodies that represent national worker interests. Management might try to exploit this thanks to the worker involvement of *all European employees* in an SE. For example if a German SE with French and German members on the supervisory board decides to close a factory in Germany and build a new one in France this will lead to conflicts amongst the worker representatives. In such a situation it is easier for the shareholder representatives of the supervisory board to achieve needed majorities as opposed to a situation where the supervisory board consists of German worker representatives only. The potential to play off the

[9] Gesetz über die Mitbestimmung der Arbeitnehmer §7 para. 1 no. 3. For companies in some sectors of the heavy industry there are other rulings. See Addison and Schnabel (2011) for a more comprehensive treatment of German codetermination.

[10] SE-Ausführungsgesetz §16 and 17. These rulings also prescribe an upper limit to the supervisory board size and demand the size has to be divisible by 3.

worker participants against each other will be the greater the more the nationalities of worker representatives differ on the supervisory board.

On the other hand, workers can function as monitors. If workers are effective monitors, shareholder / management agency conflicts can increase if worker's power is impaired. This will work against Hypothesis 7.

Last, managers can use the adoption of the SE to introduce changes to the statutes that serve their own interest. I hypothesize that:

HYPOTHESIS 8:
German companies that extend tenure of management or supervisory boards or introduce veto powers for their CEOs have lower abnormal returns upon announcement of their decision to become a SE.

The rules that govern SEs allow the supervisory and management board to have six years of tenure. In contrast, German members of both boards can have only five year contracts. Longer contracts make it more costly for shareholders to replace members of the supervisory and management board when they perform poorly. For companies that are ruled by "Mitbestimmungsgesetz" it was impossible to introduce a veto for the CEO. In SEs a CEO veto is possible. A CEO that vetoes decisions that decrease her private benefits of control but increase shareholder value is more harmful to shareholders than a CEO who does not have this power. This reasoning leads to Hypothesis 8.

3.3 Description of registered SEs and final sample

I identify companies from `http://www.worker-participation.eu` which is managed by the European Trade Union Institute (ETUI).[11] The ETUI uses the Official Journal of the European Union, where member states must record new SE registrations, and it uses its country experts to learn about SE registrations. The ETUI website provides information about the name of the company, the country where the company is registered, date of registration, board structure

[11] The ETUI is part of the European Trade Union Confederation (ETUC) which is the umbrella organisation of trade unions within the EU.

(one-tier / two-tier) and various variables concerning worker involvement. The data is often incomplete. So, the sample sizes underlying the figures and tables in this section vary. I stop collecting data in November 2010.

Figure 3.1 depicts the number of SE registrations from the last quarter of 2004 to the fourth quarter of 2010. The figure documents that SE registrations increase over time. The slight decrease in the fourth quarter of 2010 is an artifact of the incomplete data collection in this quarter. By mid November 2010 there are 624 registered SEs. The increase shows that there is a steady interest in choosing the SE.

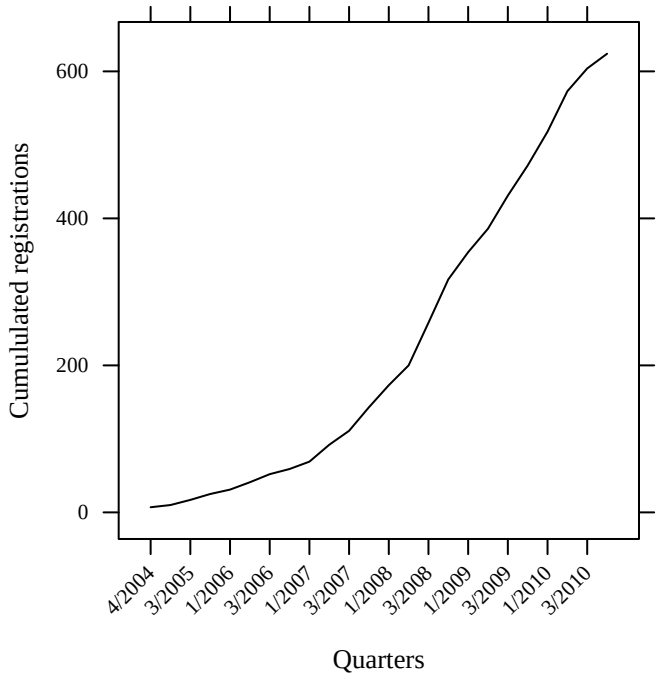


Figure 3.1: Cumulated number of SE registrations per quarter

This figure displays the cumulated number of SE registrations in the EU and the EAA from the fourth quarter of 2004 through the fourth quarter of 2010.

Figure 3.2 depicts the number of SE registrations by country. The number of SE registrations is scaled by new public and private limited companies registrations during the time that the first SE registered until the last SE registered in a country.[12] Although, the numbers must

[12]New private and publicly limited company registrations are from http://epp.eurostat.ec.europa.eu.

be interpreted carefully because the SE , a public limited company, is compared to private and public limited companies, it is clear from the figure that the majority of limited companies are not SEs. In particular, assuming that 2 % of all limited companies are public limited companies (the figure for Germany in 2009) only about 4 % of German public limited company registrations were SEs. Overall Cyprus has the highest proportion of SE registrations, closely followed by the Czech Republic. Luxembourg, Germany and Austria come next and the remaining countries in the figure have about the same level of SE registrations. Greece, Italy, Romania, Finland and Iceland have no SE registrations. Figure 3.2 also suggests that countries ruled by participation laws attract more SEs. This relationship is not monotone, however, as companies with no participation laws tend to have relatively more SEs than countries with participation laws only for state-owned companies.

The ETUI categorizes SEs into four categories: normal, shelf, empty and UFO. Normal SEs have a clear business purpose and have employees. Shelf SEs are established to be sold to buyers that do not want to lose time on the legal registration process. Empty companies lack employees. Last, UFO SEs lack information to classify them in any of the foregoing categories. Figure 3.3 depicts the number of SE registrations by category and country. From the figure, most normal SEs are in Central and Western Europe. Most normal SEs are in Germany. To a lesser extend normal SEs are in Eastern Europe, the Scandinavian countries (with the exception of Norway) and the U.K.. Cyprus is an outlier with most of the normal SEs relative to new limited liability registrations. Figure 3.3 demonstrates that the Czech Republic, that hosts the second highest number relative to new company registrations and the highest total number of SEs, has a large number of shelf, empty and UFO SEs. Most of the SEs in Luxembourg do not have any employees (often these SEs are in the financial service industry).

In order to test the hypotheses of the previous section, I identify two subsamples within the ETUI population. The first subsample are publicly listed companies. In addition to established

When data is missing I extrapolate the last year with data to future years without data. New registrations are for service and industrial firms only. Ireland has 10, Liechtenstein has 4 and Poland has 2 SEs. The countries are not depicted in Figure 3.2 because Eurostat provides no data on new limited liability company registrations for them.

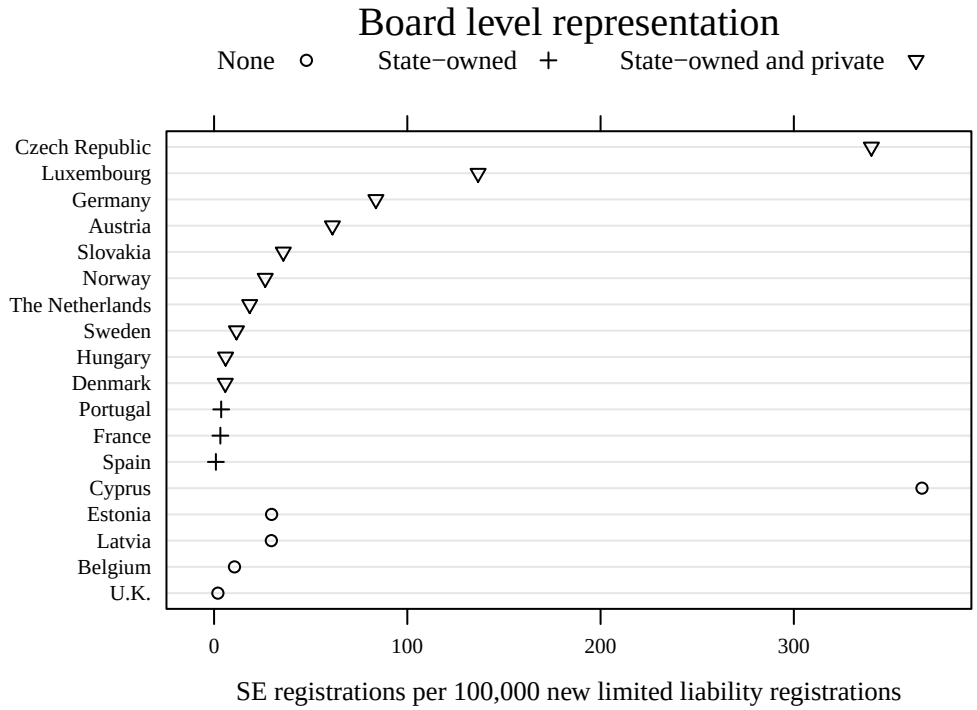


Figure 3.2: SE registrations by country

This figure displays the number of SE registrations in the EU and the EAA by countries. The numbers are scaled by new company registrations of limited liability companies in the country from the date that the first SE registered until the last SE registered. Ireland, Liechtenstein and Poland have registered SEs, however, no information on new company registrations is available. Therefore, these countries are excluded from the figure.

SEs, I also include companies that have announced their intention to become an SE and are in the process of transforming or abandoned their plans to become SEs. These planned and abandoned SEs are also on ETUI's homepage. Irrespective of whether SE adoption is completed, planned or abandoned I refer to the company as SE. I find 57 SEs that are publicly listed. Five of these SEs were SEs when they listed, one is a closed end fund and one is a cash shell. I cannot find data in DATASTREAM for two SEs. Hence, I exclude these SEs from further analysis. Announcement dates are collected from DGAP, Bundesanzeiger (for German SEs), EuroAdhoc and `http://www.newsweb.no` (for Norwegian SEs) and ETUI's homepage because ETUI claims to have some of its information from internal sources. I also search FACTIVA and the SE's homepage. If I find announcements on Factiva that are earlier than the other sources I use

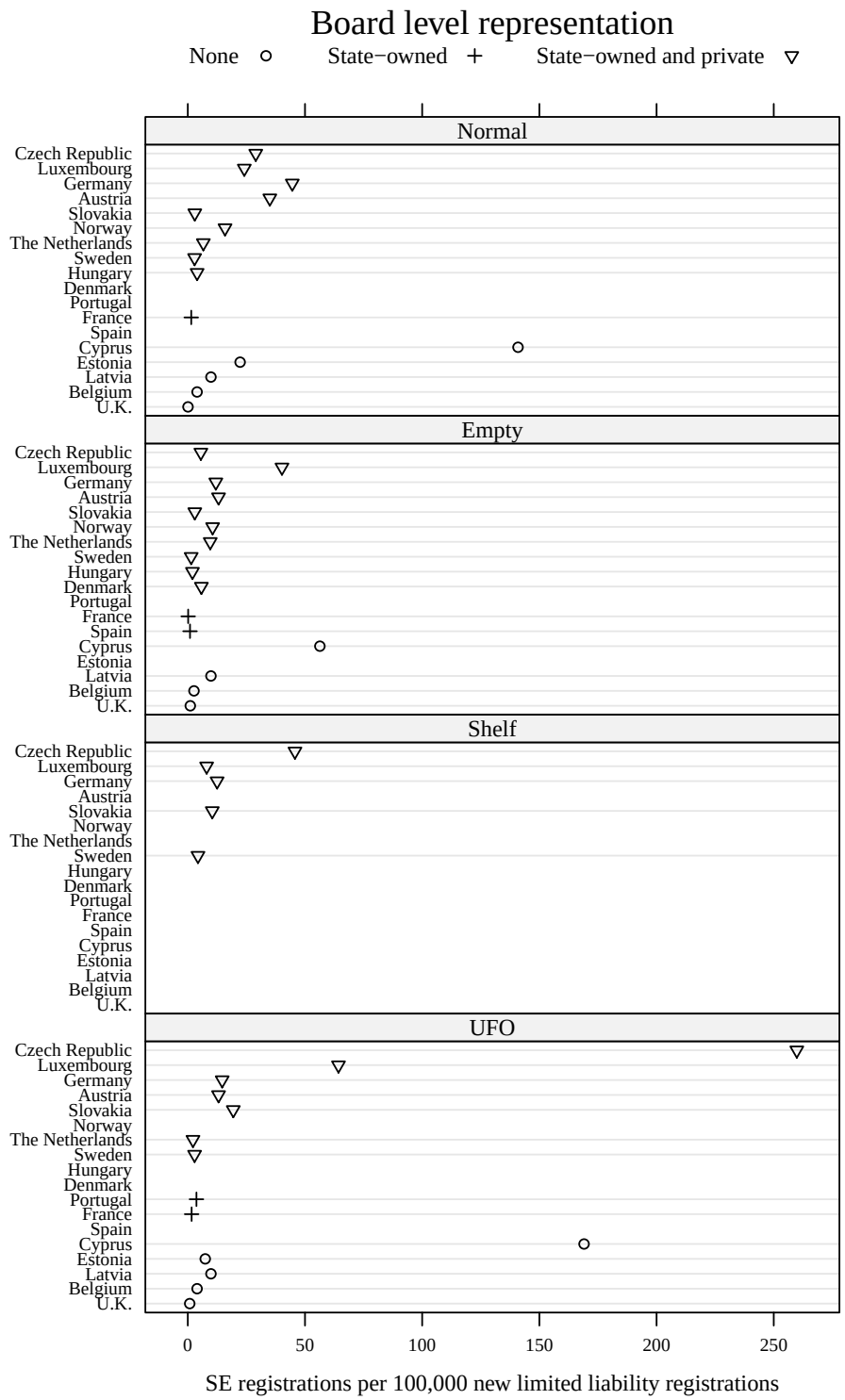


Figure 3.3: SE registration by category and country

This figure displays the number of SE registrations in the EU and the EAA by country and category. Normal SEs have a clear business purpose and have employees. Shelf SEs are established to be sold to buyers that do not want to go through the legal registration process. Empty companies lack employees. UFO SEs lack information to classify them in any of the previous categories.

the FACTIVA date. I am able to find announcement dates for all but one of the remaining 48 SEs. This leaves me with 47 SEs to analyse. Table 3.9 in the Appendix gives an overview of the announcement dates and their source. Events surrounding the announcement day are also in Table 3.9. These events indicate considerable noise in the event window. Unfortunately, some SEs release additional information when they announce their transformation to an SE. The rows containing these SEs are in grey. In the remainder of this paper I will make a distinction between the full sample and the clean sample, which excludes SEs with multiple announcements on the event day. The clean sample consists of 29 SEs.

The second subsample consists of all SEs that have a web presence and have a WORLDSCOPE identifier. For this sample of listed and non-listed SEs, I draw a control group of EU / EAA companies matched on four digit standard industry classification code from WORLDSCOPE.

Accounting and price data is from WORLDSCOPE and DATASTREAM, respectively.[13] I use exchange rates from the European Central Bank to convert all prices and accounting numbers to Euros.

Starting with the second subsample, Table 3.1 displays descriptive statistics of accounting data for listed and non-listed SEs in the registration year. There are 48 listed and non-listed SEs with complete data. The Table shows, that SEs are larger and less profitable than the control sample of EU companies matched on industry (significant at the 2 % level for testing difference in means and medians).

For listed SEs, I also collect data from SEs' conversion or merger reports.[14] In particular, I record the motives of companies to become SEs, the mode of formation (merger / conversion / subsidiary / holding), whether the company changes its board structure, the formation costs,

[13] For a few German SEs that have missing data in WORLDSCOPE I use data from http://www.unternehmensregister.de, an official source for financial statement data.

[14] Article 20 of the SE regulation rules that a company's management has to draw up draft terms of merger. These have to be approved by the general meeting (Article 23). Article 37 par. 4 rules that the report must be "explaining and justifying the legal and economic aspects of the conversion and indicating the implications for the shareholders and for the employees of the adoption of the form of a SE. " The SE regulation provides the minimum for the publication requirements of SEs as member states can impose additional requirements.

Table 3.1: Accounting numbers for the publicly listed SE sample

This table contains descriptive statistics for return on assets (net income divided by total assets) and total assets for SEs and a control group matched on industry and country in the year that the company becomes a SE.

	SEs		Control	
	ROA	TA[a]	ROA	TA[a]
Min	-0.13	120	0.00	24
Q25	0.01	319,615	0.01	35,600
Q50	0.03	941,950	0.04	149,280
AVG	0.03	2.7e+07	0.08	1.9e+07
Q75	0.06	5,160,705	0.08	1,274,383
MAX	0.18	1e+09	11.26	1.3e+09
N	48	48	655	655

[a] EUR (Thousands)

the composition of workers in the SNB and whether the SE announces its intention to change its seat. The conversion or merger report is considerably more detailed for German SEs than for other SEs.[15] For this reason the data that I can collect for German SEs are more detailed. Specifically, for German companies only, I collect the change in the number of supervisory board members, the worker involvement law that rules the company, whether the tenure for the management or supervisory board is extended and whether the CEO can veto decisions in the SE. Pursuant to German law, members of the (management or supervisory) board can only have five year contracts. SE law, in contrast, allows board members to have six year contracts. Similarly, German companies that are ruled by "Mitbestimmungsgesetz" must have a board member that is responsible for work and social matters.[16] This member is on equal footing with the CEO. Therefore it is not possible to introduce a CEO veto in a German company ruled by "Mitbestimmungsgesetz". The sample sizes in the tables that follow vary with the level of detail from the conversion or merger plans.

[15] A German conversion or merger report usually consists of well over 100 pages, whereas that of other companies consists of about ten pages. The exception is NYSE listed James Hardie SE, located in the Netherlands, that publishes more than 800 pages.

[16] §33 Mitbestimmungsgesetz .

Table 3.2 displays the number of publicly listed SEs in the renewable energy and gambling industries, the number of SEs that are formed by merger versus conversion and the number of SEs in different member states. All 6 SEs that are in the renewable energy industry are registered in Germany. These SEs rely on state subsidies that make renewable energy attractive. Also the 3 companies in the (online) gambling industry are sensitive to regulation that threatens to ban their operation (The Economist, 2009). Altogether about 19 % of the companies are in the gambling or renewable energy industries. This significant percentage suggests that the SE attracts companies that operate in industries that are particularly exposed to law changes. Most of the publicly listed SEs are formed by conversion (80 %) – 20 % are formed by merger. Hence, none of the publicly listed SEs are formed as a holding or subsidiary. Most of the mergers that form a SE are with wholly owned subsidiaries.[17] The overwhelming majority of publicly listed SEs are in Germany. There are 20 member states that do not host any publicly listed SEs. The column labelled "SC_TO" indicates the number of SEs that were first registered in a different member state and subsequently changed their seat to the country indicated in the row. About 13 % of the companies subsequently changed their seat.[18] The most attractive destinations are Cyprus and Luxembourg.

Table 3.3 lists the stated motives to become an SE. As SEs state more than one motive in their conversion or merger reports, rows labelled "All motives" can contain the same company multiple times. In contrast, the rows labelled "First motive" only contain the motive that appears first in a SE's conversion or merger report. The vast majority of SEs state that they want to emphasize their European or international image. This motive is puzzling because the improvement of the European image could be achieved cheaper by a simple name change for example. The second most frequent motive relates to the economic advantages of the SE. Some motives

[17] Only Allianz and Songa Offshore do not hold 100 % in the companies with which they subsequently merge. Allianz holds 55.4 % and Songa Offshore holds 99.65 % at the day of the announcement.

[18] Two of those companies are Norwegian firms that relocate to Cyprus for tax reasons. One company, Betbull, is an English Plc that has most of its business in Austria and wants to relocate there. James Hardie, registered in the Netherlands, moves to Ireland for tax purposes. Elcoteq relocates from Finland to Luxembourg to be closer to its customers and Fotex Holding SE relocates to Luxembourg for unknown reasons.

Table 3.2: Number of SEs by industry, mode of formation and country

This table contains the number of SEs within industries that are sensitive to changes in legislation, the number of SEs that are formed by merger versus conversion and the number of SEs in different member states. The column labelled "SC_TO" indicates the number of SEs that were registered in a different member state first and subsequently changed their seat to the country indicated in the row.

Country	Count	SC_TO	Established	Count	Industry	Count
Germany	29	0	Conversion	37	Other	38
France	4	0	Merger	9	Renewable energy	6
Austria	3	1			Gambling	3
Cyprus	2	2				
Luxembourg	2	2				
Norway	2	0				
The Netherlands	2	0				
Belgium	1	0				
Ireland	1	1				
Sweden	1	0				

are rather vague such as cost savings or improved flexibility.[19] Many motives relate to corporate governance issues. The most frequent corporate governance motive is that SEs want to give all their workers (as opposed to only the domestic workers) a voice in the company affairs. Some companies state that they want to keep their proven corporate governance system. The SE ensures that they can keep their supervisory board size because if they continued as a conventional public limited company, worker involvement laws would force them to have larger supervisory boards.

Table 3.4 depicts the frequency of different worker participation laws among German publicly listed SEs. Most of the German SEs (50 %) do not have labor participation in the board.[20] 31 % of German SEs are ruled by the strongest worker participation law – MitbestG1976. 19 % of German SEs are ruled by the One Third Act that requires that a third of the members of

[19]Some companies give hints where cost savings could come from. Companies that merge with a wholly owned subsidiary state that they can save on the redundant board of the subsidiary. Companies also expect less legal and administrative costs when they turn subsidiaries into branches.

[20]No participation law rules the company Surteco. Yet it applies the One Third Act on a voluntary basis. It is coded as having no participation law.

Table 3.3: Stated motives to become a SE

This table lists the frequency of motives that SEs mention in their conversion or merger reports to become a SE. Rows labelled "All motives" contain all motives recorded in a SE's conversion or merger report. In consequence, these rows can contain the same SE multiple times. The rows labelled "First motive" contain the frequency of motives that appear first in the conversion or merger report.

Motive	Count
All motives:	
European / international image	21
Possibility to relocate	11
Involvement of all European workers	9
One-tier board structure	6
Reduction of supervisory board size	6
Better corporate governance	5
Cost savings	4
Future expansion	4
Higher cross border mobility	4
Improved flexibility	3
Easier recruitment of international staff	2
Attraction to investors	2
Tax reasons	2
Internationalization	2
Enhancing competitiveness	1
Evade MitbestG	1
Admission to Austrian stock exchange	1
Develop corporate governance structure	1
Faster and more precise information of markets	1
Optimize work of board	1
Having only one financial regulator	1
Let directors be closer to market	1
Reduction of management team	1
Increase in core capital	1
Inreased attention	1
1st motive:	
European / international image	18
Possibility to relocate	5
One-tier board structure	4
Higher cross border mobility	2
Internationalization	2
Better corporate governance	1
Cost savings	1
Improved flexibility	1
Having only one financial regulator	1
Future expansion	1

the supervisory board are labour representatives. Table 3.4 also lists the frequency of different statute changes for German companies when they become SEs. The majority of SEs does not strengthen the CEOs power by granting him a veto. But many SEs do not change the default in SE law that vests the CEO with a tie breaking vote. Whereas the majority of German SEs does not increase the possible tenure of its management board, most of German SEs make it possible for their supervisory board members to have six year contracts. "Possible" means that a longer tenure is the exception. 36 % of SEs explicitly prohibit longer tenures and 18 % of German SEs make a longer tenure the default.

18 % of companies reduce the size of their supervisory board. This figure likely understates the desire of companies to control the supervisory board size because companies can preempt future supervisory board increases by becoming SEs. Indeed, some companies state that they want to preempt future supervisory board increases with the formation of a SE.[21]

For all German and non-German SEs with available data Table 3.4 also reports the number of SEs that change their board structure and the number of SEs that announce to relocate. Three SEs announce their intention to change their seat in the merger or conversion report. Among all SEs with information in the conversion or merger report, 26 % change their board structure. In all the cases the change is from two-tier to one-tier board structure. I can collect data for board composition following the proposed change from two-tier to one-tier board for 8 companies. In all companies but one the former CEO of the two-tier board is a member of the one-tier board. In all cases but one the majority of the one-tier board is made up of former members of the supervisory board. I can collect complete data on board structure change and the stake of the largest blockholder in the SE for 24 SEs. If blockholder stake proxies for private benefits of control then Adams and Ferreira (2007) argue that the one-tier structure can be optimal for companies with smaller blockholder stakes. In the 5 SEs that change their board structure and have data on blockholder stake, the largest blockholder holds on average 31.6 % of outstanding

[21] Two companies – Porsche and Fresenius – state that without the formation of a SE they would have to increase their supervisory boards from 12 to 20. Porsche and Fresenius appear as a zero change in supervisory board size in Table 3.4.

Table 3.4: Frequency of different changes to the statutes of German companies

This table lists the frequency of the different worker participation laws among German SEs. The table also presents the frequency of different changes in the corporate governance of the SEs as well as the number of SEs that announce to change their seat at the same time that they announce their intention to become a SE.

German SEs		German SEs		German SEs		All SEs	
Tenure MB	Count	Tenure SB	Count	Veto	Count	Relocation	Count
FALSE	21	POSSIBLE	10	FALSE	22	FALSE	26
POSSIBLE	4	FALSE	8	TRUE	3	TRUE	3
DEFAULT	3	DEFAULT	4				

German SEs		German SEs		German SEs		All SEs	
Breaking vote	Count	Participation law	Count	Reduction SB	Count	Change board structure	Count
TRUE	20	None	13	FALSE	18	FALSE	26
FALSE	5	MitbestG1976	8	TRUE	4	TRUE	9
		One-Third Act	5				

shares. In contrast, in SEs that keep their board structure the largest blockholder holds on average 41.6 %. The difference is not significant, however.

Table 3.5 shows summary statistics of formation costs and the concentration of nationalities in the special negotiating body (SNB). The SNB represents EU workers of a company upon formation of a SE. Concentration is measured by the Gini coefficient. A Gini coefficient of 1 means that all seats are represented by one nationality. In contrast, a Gini coefficient of 0 indicates that the European countries are equally represented within the SNB. Comparing the formation costs with the distribution of total assets in Table 3.1, that depicts accounting data for all SEs (listed or not), shows that formation costs are negligible. The most expensive formation is Allianz that comprised the merger with a subsidiary that it did not wholly own. The Gini coefficient is spread around a median of 0.52. There is a tendency for a SE's workforce to concentrate in one EU country as signified by the mean of 0.59.

Table 3.5: Formation costs and concentration of nationalities in the SNB

This table depicts summary statistics for the formation costs of a SE and the Gini coefficient that measures the concentration of nationalities in the SNB. Formation costs are in thousand EUR.

	Cost THD EUR	Con-centration
MIN	30	0.00
Q25	238	0.34
Q50	800	0.52
AVG	7,026	0.59
Q75	3,000	0.87
MAX	95,000	0.97

3.4 Evidence on the hypotheses

On average there are no significant abnormal returns when a company announces to become a SE. Table 3.6 lists the mean of cumulated abnormal returns (CARs) around the announcement day for different event windows. Three tests test the significance of CARs. The ordinary T-test (MacKinlay, 1997) (labelled "T"), the rank test (Corrado, 1989) (labelled "Rank") and the sign test (Corrado and Zivney, 1992) (labelled "Sign"). CARs and the test statistics are reported for the whole and the clean sample. I use the market model to calculate abnormal returns. The event windows are symmetric to capture rumors and information about the SE transformation that diffuse before and after the announcement, respectively. All tests cannot reject the hypothesis that there are no abnormal returns on average. In addition to the insignificance of returns, their direction is inconclusive for the shortest event window. In the shortest event window, returns are positive in the whole sample and negative in the clean sample. Over the longer event windows returns are positive. The finding is consistent with that of Eidenmüller et al. (2010) who also fail to find significant returns on average.

Figure 3.4, a time series plot of CARS, adds to the inconclusive findings. The plot shows considerable variation in the event window. There is a negative trend that reaches a through

Table 3.6: Announcement returns for companies that become SEs

This table lists the mean cumulated abnormal returns (CARs) around companies' announcement days to become SEs for different event windows. The table also reports test statistics for the t-test ("T"), the rank test ("Rank") and the sign test ("Sign").

	Whole sample				Clean sample			
	CAR	T	Rank	Sign	CAR	T	Rank	Sign
[0;0]	0.04	0.08	0.46	0.44	-0.59	-1.00	-1.07	-0.93
[-1;1]	0.86	1.12			0.22	0.22		
[-4;4]	1.87	1.41			0.72	0.40		
[-9;9]	0.59	0.31			1.77	0.68		
[-19;19]	1.34	0.48			0.48	0.13		

six days before the event at a CAR of about -1.5 % (about -1 % for the clean sample) and then a reverse in trend until the sixth day after the event. For the median company the conversion / merger plan is released 23 calendar days after the announcement and the general meeting to decide on the adoption of the SE takes place 83 calendar days after the announcement. It is therefore unlikely that these two events can explain the observed pattern.

In conclusion, I have to reject Hypothesis 1: There are no significant announcement returns on average.

In order to test the remaining hypotheses I regress the CARs in the 3 day event window on different covariates. One concern is that not all changes to the company that encompass SE formation are released on the announcement day. Many companies, however, announce the main changes that they want to implement when they announce their intention to become SEs. Other companies have conference calls at the day of the announcement or one day thereafter. To the extend that changes to the company following SE adoption are not released to the market I loose power to find evidence for the hypotheses.

Table 3.7 provides support for Hypothesis 2. The size of the coefficient of 2.5 % on the dummy variable "Regulated", suggests that companies in regulated industries have on average 2.8 percentage points higher CARs (p-value: 0.051). Regulated industries are the online

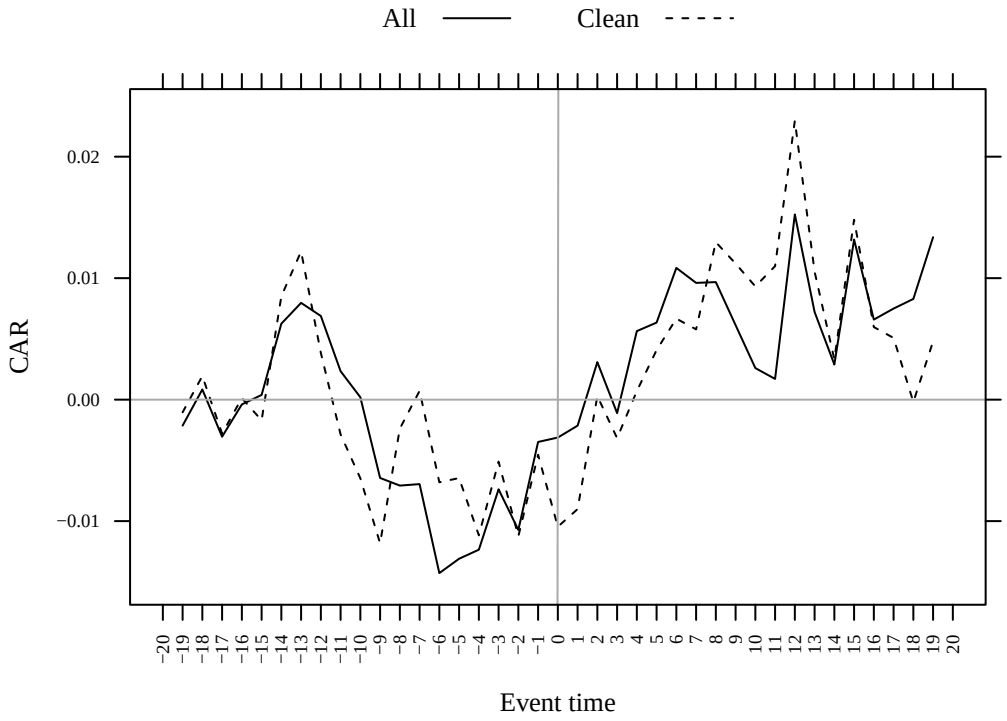


Figure 3.4: Cumulated abnormal returns for companies that become SEs

This figure displays cumulated abnormal returns for 47 companies that announce to become SEs over an event window that starts 19 days prior to the announcement and ends 19 days thereafter. The solid line represents the full sample and the dashed line represents companies that did not release any information, apart from their intention to become SEs, on the announcement day (clean sample).

gambling and the renewable energy industry. As argued above, the companies in the online gambling industry need a special permit to do business and face negative sentiment in some EU countries. Companies in the renewable energy industry are all German and depend on state subsidies that will decrease in the future. Therefore, the evidence supports the hypothesis that relocation or the threat of relocation is more valuable for companies that operate in industries that critically depend on state support.

Also Hypothesis 3 is supported by the evidence in Table 3.7. Companies that change their board structure from two-tier to one-tier, indicated by the variable "Change structure", have on average 3.7 percentage points lower CARs. The effect is highly significant (p-value: 0.018). This large negative effect is consistent with a weakening of the monitoring function of the board

Table 3.7: Regressions of cumulated abnormal returns on company characteristics

This table summarizes regressions of cumulated abnormal returns on company characteristics for companies that announce to become SEs. Company characteristics are: "Change structure" an indicator that is 1 if the SE changed its board structure from two-tier to one-tier and zero otherwise, "log(TA)" the logarithm of total assets, "Regulated" an indicator that is 1 if the company operates in the online gambling or renewable energy industry and zero otherwise, "Germany" an indicator that is 1 if the company is located in Germany and zero otherwise, "Reduction" an indicator variable that is 1 if the SE reduced its board size, "One-Third Act" an indicator that is 1 if the SE is governed by the One Third Act and zero otherwise, "MitbestG1976" an indicator that is 1 if the SE is governed by the Mitbestimmungsgesetz, "Concentration" the Gini coefficient of workers in the Special Negotiating Body and "Entrenchment" an indicator variable that is 1 if the CEO can veto decisions or if the tenure of the board has been extended from 5 to 6 years. The numbers in parentheses are standard errors for the coefficient estimates in the respective row above. N is the number of observations in the regression. Significance codes are: $\bullet \sim 10$ %, $^{*} \sim 5$ %, $^{**} \sim 1$ % , $^{***} \sim< 1$ %.

Variable	Dependent variable: CAR[-1;1]							
Constant	0.007	-0.012	-0.006	-0.027	-0.090	-0.028	0.032	0.002
	(0.028)	(0.021)	(0.022)	(0.068)	(0.068)	(0.038)	(0.060)	(0.029)
Change structure	-0.037*							-0.035*
	(0.015)							(0.016)
log(TA)	0.001	0.001	0.001	0.003	0.008	0.002	-0.001	0.001
	(0.002)	(0.002)	(0.002)	(0.005)	(0.005)	(0.002)	(0.004)	(0.002)
Regulated		0.028*						0.010
		(0.014)						(0.016)
Germany			0.006					
			(0.013)					
Reduction				-0.029				
				(0.028)				
One-Third Act					0.006			
					(0.025)			
MitbestG 1976					-0.028			
					(0.030)			
Concentration						0.008		
						(0.026)		
Entrenchment							-0.009	
							(0.018)	
R^2_{adj}	13.53 %	5.72 %	-3.38 %	-4.35 %	0.95 %	-3.86 %	-9.34 %	11.60 %
N	32	42	42	22	24	27	21	32

following the change from the two to one-tier structure.

In contrast, there is no support for the remaining hypotheses. Although German companies have on average larger abnormal returns than other EU firms the effect is insignificant (p-value: 0.622). Inconsistent with Hypothesis 5, German companies that reduce their board size have lower abnormal returns, but the effect is not significant.[22] One reason for the insignificance might be, that there are only 22 companies in this regression and therefore there is little power to reliably estimate any effects. Companies ruled by the strictest participation law, "MitbestG1976", have lower but insignificant CARs. This observation is inconsistent with Hypothesis 6. One explanation for the finding of no different CARS for German companies or companies with different worker participation laws is the pricing of these effects long before the announcement day. If investors anticipated, at the time that the SE regulation was published, that the regulation will have a differential impact for German companies or companies governed by "Mitbestimmungsgesetz" then I should not find any abnormal returns on the announcement day.

The coefficient on the Gini coefficient ("Concentration") is positive which implies that the higher the concentration of the European workforce the higher the abnormal returns. This result is inconsistent with Hypothesis 7. Companies that increase the tenure of their boards or introduce a veto for their CEOs ("entrenchment") have on average 1 % lower CARs consistent with Hypothesis 8. The negative effect cannot be estimated with enough confidence, however. In the last column of Table 3.7, I combine the industry membership and board structure change indicators in a multiple regression. All coefficients keep the same sign, however, the industry effect becomes insignificant. The insignificance of the industry effect is driven by lack of power as there is also no significant effect in a simple regressions of CARs on industry effects and the logarithm of total assets in the same sample of 35 companies that has complete observations on "Change structure".

In order to shed more light on Hypothesis 1 I use a sample of listed and non-listed SEs and

[22] For the two companies, Fresenius and Porsche, the conversion to a SE prevents their obligation to increase the board size. I treat these companies as if they reduced their board size

compare their return on assets before the registration as a SE with those after SE registration. In Table 3.8, "Registered" is an indicator that takes a value of 1 in the year of SE registration and beyond and a value of zero otherwise. The earliest year in the sample is the year 2000. The first two columns of Table 3.8 provide no evidence on any effect after registration. In the first specification, "Registered" is negative and insignificant and in the second specification "Registered" is positive and insignificant. Whereas in the first two columns of Table 3.8 SEs serve as their own control group, in the last two columns the set of control firm years is extended by EU / EAA companies that match the SE sample on SIC code. The row labelled "SE" reports the average ROA of companies that subsequently become SEs. If "SE" is not included in the regression the effect of SE registration is significantly negative and economically large at -4.7 percentage point. But if "SE" is included in the regression the effect of SE registration is positive and insignificant. Since "SE" captures unobserved company characteristics of future SEs I conclude that there is no significant registration effect but instead that future SEs have unobserved characteristics that cause ROA to be lower than companies that do not become SEs. The "SE" effect is significant and negative, indicating that SEs are already underperforming before they become SEs. On average companies that subsequently become SEs have about 5 % points lower return on assets. This effect is highly significant

In summary, the event study supports the hypothesis that SEs that change their board structure from two-tier to one-tier destroy shareholder value. There is some evidence that companies that are sensitive to changing legislation, such as companies in the renewable energy industry, benefit more from SE adoption than other companies. This finding is not robust over specifications and varying sample sizes. All other employee related hypotheses and the entrenchment hypothesis have to be rejected. There is no robust evidence that listed and non-listed SEs have different returns on assets after they become SEs. Instead, SEs are already underperforming their peers before they become SEs.

Table 3.8: Regressions of return on assets on event time and company characteristics

This table summarizes regressions of return on assets on event time and company characteristics. Return on assets is net income divided by total assets. "Registered" is an indicator that is 1 in the year that a company becomes a SE and thereafter and 0 before. "asinh(sales)" is the inverse hyperbolic sine of sales. "Debt" is total liabilities over total assets. "SE" is an indicator that is 1 if the company subsequently becomes a SE and zero otherwise. The first two columns of the table include only companies that become SEs. In contrast, the last two columns of the table also includes EU / EAA companies that do not become SEs in the sample period and match the SIC codes of the SE sample. The regression data spans years 2000 - 2009. The numbers in parentheses are standard errors for the coefficient estimates in the respective row above. Standard errors are clustered on the firm level. N is the number of observations in the regression. Significance codes: $\bullet \sim 10$ %, $^{*} \sim 5$ %, $^{**} \sim 1$ % , $^{***} \sim < 1$ %.

Variable	Dependent variable: ROA					
Intercept	0.0190	-0.0003	-0.0576***	-0.0516***	0.2003***	0.1982***
	(0.0280)	(0.0757)	(0.0147)	(0.0149)	(0.0501)	(0.0502)
Registered	-0.0272	0.0113	-0.0489***	-0.0058	-0.0472**	0.0019
	(0.0333)	(0.0178)	(0.0143)	(0.0216)	(0.0156)	(0.0211)
asinh(Sales)		0.0034			-0.0091$^{\bullet}$	-0.0089$^{\bullet}$
		(0.0032)			(0.0048)	(0.0048)
Debt		-0.0493			0.0011	0.0013
		(0.0741)			(0.0081)	(0.0079)
SE				-0.0471*		-0.0535**
				(0.0189)		(0.0189)
Time	Yes	Yes	Yes	Yes	Yes	Yes
Industry	No	No	Yes	Yes	Yes	Yes
R^2_{adj}	3.72 %	3.56 %	3.28 %	3.53 %	4.36 %	4.65 %
N	404	347	6,397	6,397	6,305	6,305

3.5 Summary & Conclusions

The paper relates corporate governance changes to abnormal announcement returns of companies that intend to become SEs. Companies that change their board structure from two-tier to one-tier have significant lower announcement returns than companies that keep their board structure. This finding conforms to the hypothesis that the SE can be used to weaken the monitoring function of the board.

The paper provides evidence that the ability of the SE to relocate is valuable for companies that operate in industries that critically depend on state subsidies or special state permissions:

Companies that operate in the renewable energy sector or in the online gambling industry have higher abnormal returns.

The paper does not provide any evidence that the SE generates value through weakening labors voice in the company affairs or through better tailored labor participation agreements.

Last, SEs have lower return on assets already before they become SEs. This finding indicates that SEs are structurally different than their peers before the SE adoption decision. Future research could explore this difference and relate it to the decision to become a SE.

3.A Announcement dates of SEs

Appendix

Table 3.9: Announcement dates and their source

This table depicts the dates on which sample companies announce their intention to become SEs (announcement date) and the source of the announcement date. Announcements of other information surrounding the announcement date are also in the table. Table entries are sorted in ascending chronological order. Rows overlayed by grey colour identify announcement dates on which there are multiple announcements.

Company	Announcement date	Other announcements	Source
Nordea	2003-06-02	Divestiture of a business	http://www.nordea.com
Nordea	2003-06-04	Creation of a new division	http://www.nordea.com
Nordea	2003-06-19	Formation SE by merger	http://www.nordea.com
Nordea	2003-07-03	Merger of a polish subsidiary with another bank	http://www.nordea.com
Nordea	2003-07-04	Divestiture of a business	http://www.nordea.com
Elcoteq SE	2003-12-18	Preliminary release of net sales	Hugin Press Release
Allianz SE	2005-09-07	Formation SE by merger	Financial Times Deutschland
Allianz SE	2005-09-08	Confirmation of earnings target, costs of hurricane Katrina	DGAP
Mensch und Maschine Software SE	2005-11-02	Release third quarter financial report	DGAP

Company	Announcement Date	Other announcements	Source
Mensch und Maschine Software SE	2005-11-04	Conversion SE	Factiva (Süddeutsche Zeitung)
Mensch und Maschine Software SE	2005-11-07	Director's dealing	DGAP
Mensch und Maschine Software SE	2005-11-09	Director's dealing	DGAP
Mensch und Maschine Software SE	2005-11-15	Director's dealing	DGAP
SCOR Group	2006-06-23	Release of financial data	Company homepage
SCOR Group	2006-07-04	Conversion to SE	Company homepage
Fresenius SE	2006-10-11	Conversion SE, stock split	DGAP
Surteco SE	2006-10-12	Conversion SE	DGAP
HIT International Trading AG	2006-11-06	Conversion SE	DGAP
Prosafe SE	2006-11-17	Conversion SE, disclosure of share holdings	http://www.newsweb.no
Prosafe SE	2006-10-24	Acquisition of a vessel	http://www.newsweb.no
Prosafe SE	2006-11-07	Announcement of third quarter results	http://www.newsweb.no
Prosafe SE	2006-12-01	Acquisition of a vessel	http://www.newsweb.no
BASF SE	2007-02-22	Dividend increase, stock repurchase	DGAP
BASF SE	2007-02-27	Conversion SE	DGAP
BASF SE	2007-03-14	Director's dealing	DGAP
conwert Immobilien Invest SE	2007-02-27	Conversion SE	ETUI
Odfjell SE	2007-03-01	Increase shares in a subsidiary	http://www.newsweb.no
Odfjell SE	2007-03-13	Repurchase of bonds	http://www.newsweb.no
Odfjell SE	2007-03-14	Conversion SE	http://www.newsweb.no
Odfjell SE	2007-03-16	Increase shares in a subsidiary	http://www.newsweb.no

Company	Announcement Date	Other announcements	Source
Odfjell SE	2007-03-20	Insider trading	http://www.newsweb.no
Odfjell SE	2007-03-29	Invitation to general meeting / annual report (2006)	http://www.newsweb.no
Odfjell SE	2007-03-30	Sale of ships	http://www.newsweb.no
Porsche Automobil Holding SE	2007-03-24	Decision to increase shares in VW cleared / obligatory offer to VW shareholders, formation of SE	DGAP
Porsche Automobil Holding SE	2007-03-26	Exercise of options on VW	DGAP
Porsche Automobil Holding SE	2007-03-28	Obligatory offer to VW shareholders	DGAP
eurofins scientific SE	2007-03-28	Invitation to the general meeting, conversion SE	Le Bulletin officiel des annonces civiles et commerciales
Wiener Privatbank SE	2007-04-24	Conversion to SE, announcement of financial numbers, extension of the board	EuroAdhoc
Wacker Neuson SE	2007-07-19	Building of a new factory in USA	elektronischer Bundesanzeiger
Wacker Neuson SE	2007-08-14	Formation of SE by merger with Neuson Kramer Baumaschinen AG	elektronischer Bundesanzeiger
Wacker Neuson SE	2007-08-15	Release of consolidated annual financial statement (2006)	elektronischer Bundesanzeiger
Wacker Neuson SE	2007-08-16	Release of interim report (2007)	elektronischer Bundesanzeiger
I.M. Skaugen SE	2007-09-17	Formation SE by merger, formation of a joint venture	http://www.newsweb.no
I.M. Skaugen SE	2007-09-27	Publication of merger plan	http://www.newsweb.no
I.M. Skaugen SE	2007-10-09	Third quarter results	http://www.newsweb.no

Company	Announcement Date	Other announcements	Source
Klöckner & Co. SE	2007-09-20	Conversion SE	EuroAdhoc
Klöckner & Co. SE	2007-09-21	Acquisition of US steal division	EuroAdhoc
Klöckner & Co. SE	2007-10-08	Announcement of financial statement numbers	EuroAdhoc
Interseroh SE	2007-09-26	Conversion to SE	EuroAdhoc
Catalis SE	2007-09-07	Conversion of (hybrid) debt in equity	
Catalis SE	2007-10-03	Conversion SE, introduction of holding structure	DGAP
Catalis SE	2007-10-15	Launch of the product 'Rail Simulator'	DGAP
Songa Offshore SE	2008-02-29	Conversion SE	http://www.newsweb.no
SGL Carbon SE	2008-03-12	Conversion SE, release of financial statement	Company homepage
SGL Carbon SE	2008-03-25	Director's dealing	DGAP
GfK SE	2008-03-31	Conversion SE, release of financial statement	Company homepage
IMW Immobilien SE	2008-04-11	Formation SE, merger with Straet Vastgoed N.V., invitation to annual meeting	elektronischer Bundesanzeiger
IMW Immobilien SE	2008-04-08	Release of financial statement	Handelsregister
DVB Bank SE	2008-04-10	Stock split, equity issue via authorised capital (genehmigtes Kapital), merger with DVB Bank N.V. (subsidary) and concurrent formation of SE	DGAP
DVB Bank SE	2008-04-10	Director's dealing	DGAP
DVB Bank SE	2008-04-15	Subsidiary involved in M & A deal	DGAP
DVB Bank SE	2008-04-23	Director's dealing	DGAP
DVB Bank SE	2008-04-24	Director's dealing	DGAP
DVB Bank SE	2008-04-29	Director's dealing	DGAP
betbull SE	2008-04-01	Release of financial statement	DGAP
betbull SE	2008-04-23	Conversion SE, Notice of annual general meeting	Notice of annual general meeting
Q-Cells SE	2008-05-14	Release of quarterly financial statement, formation SE by merger	elektronischer Bundesanzeiger

Company	Announcement Date	Other announcements	Source
Q-Cells SE	2008-05-16	Invitation to annual general meeting	elektronischer Bundesanzeiger
Q-Cells SE	2008-05-23	Insider trading	elektronischer Bundesanzeiger
Solon SE	2008-04-23	Issuance of convertible bonds	elektronischer Bundesanzeiger
Solon SE	2008-05-14	Release of interim report	elektronischer Bundesanzeiger
Solon SE	2008-05-15	Invitation to general meeting, formation SE	elektronischer Bundesanzeiger
Solon SE	2008-05-23	New resolution added to the agenda by minority shareholders	elektronischer Bundesanzeiger
Solon SE	2008-05-26	Issuance of employee stock options	elektronischer Bundesanzeiger
Dexia S.A.	2008-06-23	Award of new contracts in Spain	Company homepage
Dexia S.A.	2008-07-03	Conversion SE	Company homepage
Fotex Holding SE	2008-07-03	Invitation to GM, Conversion SE	http://www.bse.hu
MAN SE	2008-07-05	Conversion SE	Reuters
SCA Hygiene Products AG	2008-11-18	Periodic release of information, formation SE	elektronischer Bundesanzeiger
Colexon Energy AG	2008-11-27	Merger with Renewagy A/S, formation SE , release of financial statement info	DGAP
Colexon Energy AG	2008-12-01	Director's dealing	DGAP
Navigator Equity Solutions SE	2008-12-17	Conversion SE	elektronischer Bundesanzeiger
Sword Group	2008-12-29	Conversion SE	http://www.boursier.com
Unibail-Rodamco SE	2008-12-31	Conversion SE	ETUI
Nordex SE	2008-04-06	Convserion SE	EANS news

Company	Announcement Date	Other announcements	Source
Tipp 24 SE	2009-05-05	Convserion SE, Invitation to General Meeting	Handelsregister
James Hardie Industries SE	2009-06-23	Conversion SE	Conference call
Cloppenburg Automobil SE	2009-06-25	Conversion SE	ETUI
Bilfinger Berger SE	2009-09-08	Conversion SE	DGAP
net SE	2010-02-22	Conversion SE	ETUI
Aixtron AG	2010-03-10	Conversion SE	DGAP
Jaxx SE	2010-04-23	Conversion SE	DGAP
Impreglon SE	2010-05-18	Conversion SE, Invitation GM	Handelsregister
REpower Systems AG	2010-09-03	Conversion SE	Handelsregister
Puma AG	2010-10-18	Conversion SE	EANS AdHoc

Chapter 4

Persistent Optimism or Pessimism in Analysts' Earnings Forecasts: Can an Individual Bias Correction Improve the Consensus Forecast?

Butler and Lang (1991) show that some analysts' earnings forecasts are persistently optimistic or pessimistic relative to consensus forecasts. The reasons for these biases are the subject of a large literature. Francis and Philbrick (1993), Das et al. (1998) and Lim (2001), among many others, argue that analysts are optimistic to curry favor with management and obtain priviledged access to private information. Dugar and Nathan (1995), wei Lin and McNichols (1998) and Dechow et al. (2000), among others, find evidence that analysts want to win investment banking business and therefore issue optimistic forecasts for these potential customers. Jackson (2005) puts forward the hypothesis that analysts are optimistic because they want to win trading business from investors who do not do their own research. There are only few papers that explain why some analysts are pessimistic. One of them is Matsumoto (2002) who argues that firms appreciate pessimistic analysts as their forecasts are easier to beat. A mitigating effect to these

biases are analysts' career concerns that are studied by Hong and Kubik (2003), Cowen et al. (2006), and Fang and Yasuda (2009).

A consequence of these different incentives and tradeoffs is that the analyst's loss function, which maps her forecast errors into losses, is not symmetric. Rodriguez (2007) explicitly shows how an asymmetric loss function arises from the tradeoff between different analyst incentives. Clatworthy et al. (2005) derive predictions from a model with asymmetric loss functions, and Markov and Tan (2006) and Rodriguez (2007) show that the null hypothesis of forecast efficiency cannot be rejected in a model that allows for asymmetric loss functions. A different strand of the literature argues that analysts suffer from cognitive biases, so that biases cannot be explained by rational tradeoffs (see Bondt and Thaler (1990) or Friesen and Weller (2006)).

In this paper, we put forward a model that is based on the assumption that different analysts have different biases and that these biases persist over time. We do not model or conjecture where these biases come from. Instead, we estimate them and use them to improve the consensus forecast. Our model assumes that analysts combine public and private information to infer a perceived earnings distribution. Analysts differ in their private information, so every analyst has a different perceived earnings distribution. To model biases, we assume that every analyst has a fixed target quantile of the perceived earnings distribution that she wants to forecast. If her target quantile is the median, she will forecast the median of this distribution and exhibits no forecast bias. If she is optimistic, however, her target quantile will be higher than the median. Likewise if she is pessimistic, the target quantile will be below the median. We allow these target quantiles to vary across the firms an analyst provides earnings forecasts for, but we assume that target quantiles are constant for each analyst-firm pair.

We estimate our model separately for each of 939 firms from the IBES universe with sufficient history. The model produces estimates of individual analyst-firm target quantiles and we first analyze the determinants of analyst precision. We find that forecasts are more precise for analysts with more experience who work for larger brokers and follow more companies but fewer industries. Our further analysis shows, however, that only the size of the broker seems

to cause higher precision. In contrast, analysts who have more experience and follow more companies and fewer industries are matched to firms that are generally associated with higher precision. Our evidence therefore suggests that analysts, as they become more experienced, follow firms with better informational environment. At the same time, they follow more firms and fewer industries. We classify 73% of the analysts as optimists and 27% as pessimists. When we distinguish between these two subsamples and control for the matching between analysts and firms, the size of the broker increases precision only for the subsample of optimists but is insignificant for pessimists.

In the second step, we use our estimates of analyst target quantiles to generate an aggregate out-of-sample earnings forecast. Our model forecast is better than the consensus forecast: On average across all firms and years, it reduces the average percentage forecast error by 72% and the root mean-squared error (RMSE) by 8%. We also consider a simple correction of the consensus forecast where we deduct the historical forecast bias from the out-of-sample forecast, but this correction does not improve the consensus forecast. We then analyze individual years from 2001 to 2009 and find that our out-of-sample earnings forecast beats the consensus forecasts in years where uncertainty as measured by the dispersion in analyst forecasts is high. Uncertainty was highest in 2009, and our out-of-sample forecast led to a 15% reduction in the RMSE relative to the consensus forecast in this year. In predictive regressions of realized earnings on different forecasts, we find that our out-of-sample forecast explains 54.6% of the variation in realized earnings compared to 48.3% for the consensus forecast. In a regression on both forecasts, the consensus forecast becomes insignificant whereas our model forecast remains significant at the 10% level. We therefore conclude that our model significantly improves on the consensus forecast, especially in years with high uncertainty.

Our model also produces estimates for two variances. The first variance, which we call analyst disagreement, is the variation in the location of the perceived earnings distributions across analysts. If this variance is high, analysts disagree about the location of the earnings distribution and therefore issue different forecasts. The second variance is the variance of the earnings dis-

tribution that cannot be forecasted by anybody in our model economy. If this variance is high, analysts also issue different forecasts, but not because they disagree about the earnings distribution. Instead, analyst forecasts differ, because the variance of the earnings distribution is high and different analysts forecast different quantiles of this earnings distribution. We find that our estimate of analyst disagreement is positively correlated with analyst forecast dispersion, with the bid-ask spread, and with Amihud's (Amihud, 2002) measure of illiquidity.

We also consider a simplified version of our model that can be easily implemented with standard statistical software packages. For this simplification, we replace the term in the forecast equation that depends on the analyst's target quantile by an analyst fixed effect. We consequently call this model the Analyst Fixed Effects model, or AFE model. We show that this model performs equally well as the full model in most of our analyses. The AFE model therefore constitutes a convenient way to implement our approach in practice.

The remainder of this paper is organized as follows. The next section introduces the full model and the simplified AFE model. Section 4.2 describes the construction of the dataset, and Section 4.3 investigates the determinants of analyst target quantiles. We compare our out-of-sample forecasts with the consensus forecast in Section 4.4 and relate our two measures of uncertainty to other measures of uncertainty in Section 4.5.

4.1 A structural model of analyst forecasts

In this section, we introduce a structural model of analysts' forecasts that is based on the assumption that different analysts have different forecast biases. In addition, we propose a simpler version of the model that can be easily implemented with standard statistical software packages.

4.1.1 Full structural model

We consider a single firm and denote its earnings in year t by X_t. Earnings have two components, a predictable component μ_t which is known among analysts, and an unpredictable component

v_t that is unknown to everybody, including analysts, in the economy :

$$X_t = \mu_t + v_t. \tag{4.1}$$

Here, v_t is a normal random variable with zero mean and variance σ_v^2. We can think of the predictable component μ_t as consisting of two parts: $\mu_t = m_t + \eta_t$. The first part m_t can be mechanically forecasted from the past time series of earnings or from other data that is readily available, such as macro-economic data. For this part, analysts are not needed. The second part η_t is a random term that cannot be forecasted by non-analysts but that is known (at least in the aggregate) across analysts. The second part, η_t, is the reason why analysts add value. We do not distinguish between m_t and η_t when we estimate the model. Instead, we assume that $\mu_1, \mu_2, ...$ are parameters of the model, just like σ_v^2. The advantage of this semi-parametric approach is that we need not model the earnings process and that our estimates are not affected by any misspecification in the assumed earnings process. The disadvantage of this approach is that the number of parameters that need to be estimated is rather large.

We assume that there are N analysts $i = 1, 2, ..., N$ who follow the firm and issue forecasts. We do not require that every analyst issues a forecast in each period. The earnings forecast of analyst i at the beginning of the period t is $F_{i,t}$. Each analyst observes the predictable earnings component μ_t only with a disturbance $\varepsilon_{i,t}$ and therefore believes that earnings X_t will be drawn from a normal distribution with mean $\mu_{i,t}^b = \mu_t + \varepsilon_{i,t}$ and variance σ_v^2. We assume that the disturbance $\varepsilon_{i,t}$ is normally distributed across analysts with zero mean and variance σ_ε^2. The variance σ_ε^2 can be interpreted as disagreement across analysts regarding the location of the earnings distribution.[1]

If all analysts wanted to maximize the precision of their forecasts, they would forecast $\widetilde{F}_{i,t} = \mu_{i,t}^b = \mu_t + \varepsilon_{i,t}$. Then the mean of the forecasts, i.e. the consensus forecast, would

[1] An alternative approach is to assume that each analyst observes a public and a private signal and calculates the posterior distribution via Bayesian updating. The result would be a much more complicated model where not only the expressions for the posterior mean and variance are more complicated, but also the posterior variance differs between analysts.

be the best estimator for μ_t and therefore for the earnings X_t. We assume, however, that at least some analysts have incentives or traits so that their forecasts are pessimistic or optimistic. More precisely, analyst i always forecasts the q_i-quantile of her perceived earnings distribution.[2] Therefore, she will issue the forecast $F_{i,t}$ such that

$$\Phi\left(\frac{F_{i,t}-\mu_t-\varepsilon_{i,t}}{\sigma_v}\right)=q_i, \tag{4.2}$$

where $\Phi(.)$ is the standard normal distribution function. Rearranging yields

$$F_{i,t}=\Phi^{-1}(q_i)\sigma_v+\mu_t+\varepsilon_{i,t}. \tag{4.3}$$

In the remainder of this paper, we call $\Phi^{-1}(q_i)$ the target quantile and q_i the target probability of analyst i. An analyst who is neither pessimistic nor optimistic but only interested in maximizing her forecast precision has $q_i=0.5$. Then $\Phi^{-1}(q_i)=0$ and $F_{i,t}=\widetilde{F}_{i,t}$. If $q_i<0.5$, the analyst is pessimistic, and if $q_i>0.5$, the analyst is optimistic. The target probabilities $q_1, q_2, ..., q_N$ are parameters in our model. We do not model the reason why analysts issue biased forecasts. Instead, we estimate these biases and use them to improve forecasting.

We estimate this model for each individual firm by maximum likelihood, where the parameters are the analysts' target probabilities $q_1, q_2, ..., q_N$, the predictable earnings component $\mu_1, \mu_2, ..., \mu_T$, the economy-wide uncertainty σ_v^2 and analyst disagreement σ_ε^2. Estimation cannot be done in a straightforward way with standard statistical packages. Instead, we write down the likelihood function, concentrate out a number of parameters and solve the resulting model with numerical maximization routines. A technical document with the derivation of the concentrated likelihood function can be obtained from the authors upon request.

[2] We work with the simplest possible stability assumption that the target quantile of each analyst is constant over time. Future extensions of our model might include time varying target quantiles that change over time, e.g., with an autoregressive pattern. Due to the limited number of observations per analyst, however, it will probably not be possible to estimate an autoregressive parameter separately for each analyst. It is possible, however, to estimate this parameter if it is the same for all analysts.

4.1.2 A simplified version of the model (AFE model)

We can simplify Equation (4.3) by defining an analyst fixed effect $a_i = \Phi^{-1}(q_i)\sigma_v$. The resulting model is given by

$$F_{i,t} = a_i + \mu_t + \varepsilon_{i,t}, \tag{4.4}$$

$$\mu_t = X_t - v_t,\ v_t \sim N\left(0, \sigma_v^2\right). \tag{4.5}$$

This model can be implemented in a straightforward way with standard statistical packages like SAS or Stata. We call this model the analyst-fixed-effects model, or AFE model in order to stress the difference to the full model from Equations (4.3) and (4.1).[3] The estimates of the two models will differ in general. In the full model, the variance σ_v^2 is estimated to minimize the time-series variance in Equation (4.1) *and* the cross-sectional variance in Equation (4.3) (via the interaction with $\Phi^{-1}(q_i)$). In contrast, the same variance estimator only minimizes the time-series variance in the AFE model. In the empirical part of this paper, we always compare both models to establish whether this difference is important.

4.1.3 Out-of-sample forecasts

To generate out-of-sample forecasts for year $T+1$, we estimate both models with data up to and including year T and plug these estimates into Equations (4.3) and (4.4), respectively. Rearranging then yields for $t = T+1$:

$$\hat{\mu}_{i,T+1}^{full} = F_{i,T+1} - \Phi^{-1}(\hat{q}_i)\hat{\sigma}_v, \tag{4.6}$$

$$\hat{\mu}_{i,T+1}^{afe} = F_{i,T+1} - \widehat{a}_i. \tag{4.7}$$

Here, $\hat{q}_i$ is the estimated target probability for analyst i, $\hat{\sigma}_v^2$ is the estimated variance of the economy wide uncertainty v_{T+1}, $F_{i,T+1}$ is analyst i's forecast at the beginning of period $T+1$,

[3] Formally, equation (4.4) has not only an analyst fixed effect (a_i) but also a time random effect (μ_t), so that the model could also be referred to as "mixed effects model".

and $\widehat{a_i}$ is the estimated fixed effect for analyst i. We effectively remove the bias from analyst i's forecast $F_{i,T+1}$ and back out an estimate of analyst i's belief about the location of the earnings distribution, $\hat{\mu}_{i,T+1}$. We then average these implicit beliefs across all analysts in order to arrive at our model forecast

$$\hat{X}_{T+1} = \frac{1}{N}\sum_{i=1}^{N} \hat{\mu}_{i,T+1}. \tag{4.8}$$

For the full model, the model forecast $\hat{X}_{T+1}^{full}$ reduces to the conventional consensus forecast if $\hat{q}_i = 0.5$ for all analysts in our sample. For the APE model, the model forecast $\hat{X}_{T+1}^{afe}$ is identical to the consensus forecast if $\widehat{a_i} = 0$ for all analysts. Hence, we obtain the consensus forecast if all analyst forecast biases are zero in our sample.

4.2 Data set

From IBES, we obtain all one-year ahead earnings per share forecasts that are issued during the first month after the last earnings announcement. If an analyst issues more than one earnings forecast for a given firm during this month, we only keep the latest of these forecasts and delete all the others. We only consider U.S. companies that report their earnings in US dollars and forecasts that are in US dollars. We exclude ADRs and other types of instruments followed in IBES that are not classified as "securities". Earnings per share (both realizations and forecasts) are typically on a fully diluted basis. If they are not, we adjust them accordingly.[4]

One reason why analysts might issue biased forecasts are the incentives the analyst's broker has, e.g., because the broker wants to secure underwriting business or wants to keep up its reputation. The analyst's bias therefore might change when she changes brokers. Therefore,

[4]Payne and Thomas (2003) point out that IBES data contain rounding errors, because after adjusting them for stock splits forecasts and announcements are rounded to four digits. We choose not to use unadjusted data and adjust for stock splits ourselves, because none of the methods discussed in the literature is without its own problems. Moreover, these rounding errors are unlikely to bias our results. Our model is based on the assumption that different analysts have different biases. In extreme cases, rounding can remove existing biases, so that our model loses its competitive advantage over existing models that implicitly assume unbiased forecasts. So if anything, rounding will work against our model. Ljungqvist et al. (2009) document that the IBES database was historically unreliable for stock recommendations. As we work with newer data (downloads in 2009 and later) and with earnings forecasts we are confident that this caveat does not apply to our analysis.

Table 4.1: Description of our sample

Panel A displays descriptive statistics of key variables in our dataset. *Forecasted EPS* are one-year ahead forecasts for earnings per share, *Earnings per share* are realized earnings per share, *Std. dev. of forecasts* is the standard deviation of all forecasted EPS per firm-year, *Industries per analyst* are the number of the 49 Fama-French industries the analyst follows, *Analyst experience* is the number of years between the analyst's first appearance in the database and her forecast), and *Broker size* is the number of analysts who work for the considered analyst's employer. *Std. dev. of forecasts*, *Companies per analyst*, *Industries per analyst*, and *Broker size* are based on the complete IBES universe. Panel B shows a breakdown of our sample of 939 firms into the 10 Fama-French industries.

Panel A: Distribution of key variables

Variable	Measurement level	Obs	Mean	Std. dev.	Quantile				
					Min.	25%	50%	75%	Max.
Forecasted EPS	analyst-firm-year	120,827	1.9	4.2	-27.2	0.6	1.3	2.2	217.5
Earnings per share (EPS)	firm-year	14,603	1.5	5.4	-398.2	0.5	1.1	2.0	189.0
Consensus forcast (EPS)	firm-year	14,603	1.8	4.5	-22.8	0.6	1.2	2.1	204.6
Std. dev. of forecasts	firm-year	14,603	0.1	0.5	0.0	0.0	0.1	0.1	25.6
Total assets (TA, in million $)	firm-year	14,596	18,692	80,961	26	1,122	3,436	11,494	2,187,631
Intangible assets scaled by TA	firm-year	12,479	0.1	0.1	0.0	0.0	0.0	0.2	0.9
R&D scaled by TA	firm-year	5,334	11.5	71.4	0.0	0.1	1.5	6.7	2,430.0
Companies per analyst	analyst-year	109,182	17.8	13.1	1.0	11.0	15.0	21.0	332.0
Industries per analyst	analyst-year	109,182	3.5	3.0	1.0	1.0	3.0	4.0	28.0
Analyst experience	analyst-year	109,182	7.6	4.9	1.0	4.0	6.0	10.0	27.0
Broker size	analyst-year	109,182	65.4	58.7	1.0	22.0	50.0	88.0	326.0

Table 4.1: Continued

Panel B: Industry classification

Industry (Fama-French-10-industry)	Obs
Consumer NonDurable	62
Consumer Durables	23
Manufacturing	143
Oil, Gas, and Coal Extraction and Products	60
Business Equipment	170
Telephone and Television Transmission	25
Wholesale, Retail, and Some Services (Laundries, Repair Shops)	98
Healthcare, Medical Equipment, and Drugs	53
Utilities	62
Other	243

we estimate the model for analyst-broker pairs, even though we talk about "analysts" for the sake of readability. When an analyst changes her broker, we treat her as a different analyst. Moreover, we estimate the model separately for each firm. Hence, the analyst fixed effect a_i in Equation (4.4) is in fact an analyst-broker-firm fixed effect, and the same holds for the analyst's target probability q_i in Equation (4.3).

As our model contains a large number of parameters, we can estimate it only for firms with good analyst coverage and a sufficiently long time series of earnings announcements. We therefore require at last 10 years of uninterrupted history, each year with an earnings announcement and at least two analyst forecasts. The resulting sample has 939 firms. On average per firm, we have 129 forecasts that are issued by 63 analysts. In our analysis, we also consider the following firm characteristics from CompuStat North America: research and development expenses, total assets, intangible assets, and the SIC code. We use prices from CRSP in order to scale forecast errors. We match IBES data with CompuStat and CRSP data with the WRDS linking table.

Table 4.1, Panel A shows descriptive statistics for some key variables in our sample. Average earnings per share (EPS) is \$1.5 while average forecasted EPS is \$1.9, and the consensus forecast is \$1.8. Firm size ranges from \$26m to \$2,188bn, where the largest firm is Citigroup.

The median analyst follows 15 companies and three industries according to the Fama-French 49 industry classification. The median broker employs 50 analysts, and analyst experience (i.e. the number of years between the analyst's first appearance in the database and the forecast) is 6 years. Panel B of Table 4.1 provides a breakdown of the 939 firms in our dataset into the 10 Fama-French industries. Most firms operate in the Business Equipment and the Manufacturing industries.

4.3 Analyst optimism and pessimism

Our model assumes that some analysts are optimistic or pessimistic. They issue forecasts that are consistently above or below the consensus forecast. To test whether this assumption is warranted, we re-estimate our model with the restriction that all analyst target quantiles $\Phi^{-1}(q_i)$ equal zero. The explanatory power of this restricted model should be lower compared to the unrestricted estimation if some analysts are indeed optimistic or pessimistic. We use the likelihood ratio test and reject the hypothesis that the restricted model is as good as the unrestricted model for 79% of the firms in our sample at the 1% significance level (not shown in the tables). We therefore consider our estimates of the target probabilities of different analysts and relate them to analyst characteristics in this section.

Table 4.2, Panel A displays descriptive statistics of the parameter estimates that we obtain when we estimate the model separately for the 917 firms in our sample for which our algorithm converges. The last three lines of the table show our estimates for the predictable earnings component μ_t, and for the two variances σ_ν and σ_ε, and we will discuss these values in Section 4.5. In this section, we focus on the first three lines that show descriptive statistics for the target probabilities $q_{i,j}$ for those analysts i that issue at least one, three, or, respectively, five forecasts for firm j. For the 4,432 analyst-firm years where the analyst issues at least five forecasts over time for the considered firm, the mean target probability is 56.9% and the median target probability is 58.4. Therefore, analysts are considerably optimistic on average. However, we

Table 4.2: Description of parameter estimates

This table displays descriptive statistics of the parameter estimates from our model across the 917 firms in our sample for which our numerical routine converges. The parameters are the target probability $q_{i,j}$ of analyst i for firm j, the predictable earnings component μ_t, analyst disagreement σ_ε, and economy-wide uncertainty σ_ν. The distribution of target probabilities $q_{i,j}$ is shown for three different filters depending on the number of forecasts (one, three, and five) that she issues for firm j.

Panel A: Determinants of analysts' precision for the full model

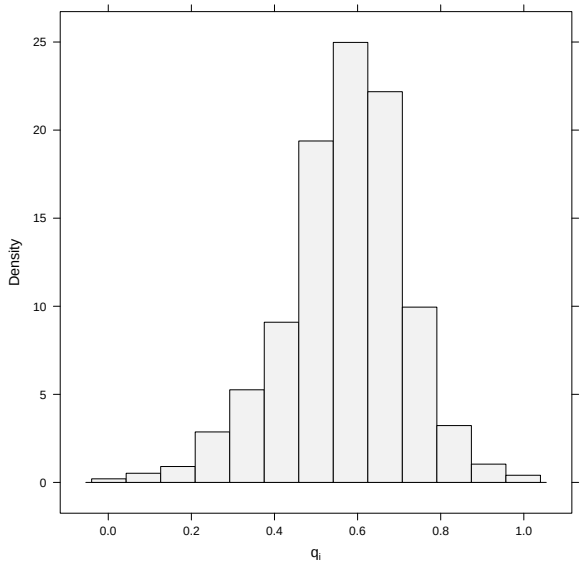
Variable	Obs	Mean	Std. Dev.	Quantile				
				Min	25%	50%	75%	Max.
Target probability $q_{i,j}$ in (%)								
all analysts-firms	57,934	57.7	17.1	0.0	48.7	59.2	68.3	100.0
analyst-firms with 3+ forecasts	14,918	57.4	15.3	0.0	49.5	59.1	66.9	100.0
analyst-firms with 5+ forecasts	4,432	56.9	14.5	0.0	49.0	58.4	66.1	100.0
Predictable earnings component μ_t	14,305	1.5	3.8	-25.2	0.5	1.1	2.0	178.3
Disagreement σ_ε	917	0.113	0.297	0.005	0.027	0.049	0.100	5.303
Uncertainty σ_ν	917	4.723	65.091	0.001	0.167	0.332	0.670	1,640.987

Panel B: Determinants of analysts' precision for the AFE model

Variable	Obs	Mean	Std. Dev.	Quantile				
				Min	25%	50%	75%	Max.
Target probability $q_{i,j}$ (in %)								
all analysts-firms	58,923	57.5	16.7	0.0	48.6	59.2	67.7	100.0
analyst-firms with 3+ forecasts	14,918	57.2	15.0	0.0	49.5	59.2	66.4	100.0
analyst-firms with 5+ forecasts	4,432	56.8	14.2	0.0	49.1	58.6	65.7	100.0
Predictable earnings component μ_t	14,603	1.5	3.8	-25.7	0.5	1.1	2.0	182.9
Disagreement σ_ε	939	0.175	0.483	0.004	0.043	0.082	0.161	10.047
Uncertainty σ_ν	939	0.900	3.875	0.000	0.167	0.336	0.684	101.965

Figure 4.1: Histogram of target probability

This figure shows the histogram of the target probabilities $q_{i,j}$ of analyst i for firm j for those 4,432 analyst-firm pairs where the analyst issues at least five forecasts.

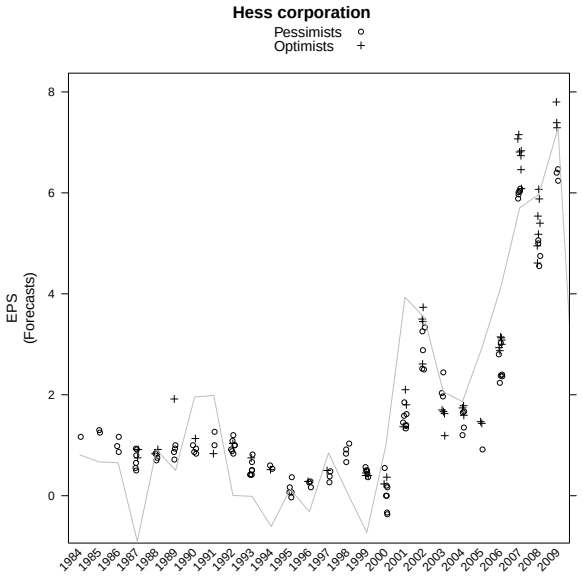


find a negative target quantile $\Phi^{-1}(q_{i,j})$ for 27,2% of all analysts (not shown in the table), i.e., these analysts are pessimists. Table 4.2, Panel B shows that our result for the target quantiles from the APE model are very similar to the results obtained with the full model. Figure 4.1 shows the complete histogram of the target probabilities for those 4,432 analyst-firm pairs where the analyst issues at least five forecasts. The figure shows that the distribution of target probabilities is skewed slightly to the left. We can reject the hypothesis that the target quantile equals zero at the 5% significance level for 82% of all analyst-firm pairs with the LM test and for 18% with the Wald test (not shown in the tables). These tests corroborate our assumption that some analysts are consistently optimistic or pessimistic.

Figure 4.2 shows for an example firm the earnings time series (solid line) and the forecasts of all analysts who issue at least three forecasts for this firm. The forecasts of the pessimists (i.e. the forecasts of those analysts for whom we estimate the target probability to be below 50%) are shown as circles while the forecasts of the optimists are shown as plusses. The figure shows that our model can distinguish between optimistic and pessimistic forecasts for this company.

Figure 4.2: Optimistic and pessimistic forecasts for Hess corporation

This figure shows a visualization of our data for an example firm. The realized earnings over time are displayed as solid line. The circles and plusses indicate the forecasts of all analysts who issue at least three forecasts for this firm over time. The forecasts of the pessimists (whose estimated target probability $\widehat{q}_i$ is below 50%) are shown as circles while the forecasts of the optimists (whose estimated target probability $\widehat{q}_i$ is above 50%) are shown as plusses.



The forecasts of optimistic analysts are indeed above those of pessimistic analysts.

We now turn to analyst precision which we measure by the natural logarithm of the absolute value of the target quantile, $\ln\left|\Phi^{-1}\left(q_{i,j}\right)\right|$. Specifications (1) and (2) in Table 4.3, Panel A regress this measure of precision on four characteristics of the analyst: The number of companies she follows; the number of the 49 Fama-French industries she follows; her age, i.e. the number of years between her first appearance in the IBES database and her forecast; and her broker's size, which we measure by the number of analysts who are associated with the same broker and who issue a forecast for any firm in the IBES universe in the same year. Dependent variables are averaged across all years in which an analyst makes a forecast for a given firm. Also, an analyst can enter this regression several times, because we estimate $q_{i,j}$ for each firm j separately. An analyst who follows three firms enters our regressions three times and we therefore cluster the standard errors at the analyst level.

Specification (1) shows that all four explanatory variables are highly significant. Analysts

Table 4.3: Determinants of analyst precision and analyst biases

This table shows regressions of analyst precision $\ln\left|\Phi^{-1}\left(q_{i,j}\right)\right|$. The independent variables are the natural logarithm of the number of companies, the natural logarithm of the number of industries the analyst follows, the natural logarithm of her experience (i.e. the number of years between her first appearance in the database and her forecast), and the natural logarithm of her broker size that is measured by the number of analysts associated to her employer in the same year. We construct these independent variables with respect to all companies that are in I/B/E/S and in CRSP and average them across all years in which the analyst makes a forecast for the considered firm. Specifications (1) and (2) are for the full sample. Specifications (3) and (4) consider the subsample of optimists where $\Phi^{-1}(q_{i,j}) > 0$, and specifications (5) and (6) the subsample of pessimists where $\Phi^{-1}(q_{i,j}) < 0$. We consider regressions with and without firm fixed effects and report the unadjusted R^2. Panel A displays the results for the full model and Panel B for the AFE model. All regressions are at the analyst-firm level, so that an analyst can enter the regression more than once. We therefore cluster standard errors at the analyst level (shown in parentheses). ***, **, and * denote significance at the, respectively, 1%, 5%, and 10% level.

Panel A: Determinants of analysts' precision for the full model

	Dependent variable: $\ln\left\|\Phi^{-1}\left(q_{i,j}\right)\right\|$					
	(1)	(2)	(3)	(4)	(5)	(6)
Sample	All	All	Optimists	Optimists	Pessimists	Pessimists
Intercept	-1.296***	-0.826***	-1.172***	-0.737***	-1.620***	-1.282***
	(0.037)	(0.076)	(0.041)	(0.081)	(0.075)	(0.205)
ln(companies)	0.065***	-0.015*	0.060***	-0.015	0.072***	-0.045**
	(0.010)	(0.009)	(0.012)	(0.010)	(0.021)	(0.018)
ln(experience)	-0.055***	0.004	-0.068***	0.000	-0.014	-0.008
	(0.010)	(0.008)	(0.011)	(0.008)	(0.020)	(0.016)
ln(industries)	-0.031***	-0.003	0.016	0.003	-0.181***	-0.021
	(0.009)	(0.008)	(0.010)	(0.009)	(0.019)	(0.019)
ln(broker_size)	-0.031***	-0.020***	-0.038***	-0.028***	-0.007	-0.005
	(0.006)	(0.005)	(0.007)	(0.005)	(0.013)	(0.010)
Firm fixed effects	No	Yes	No	Yes	No	Yes
R^2	0.21%	47.38%	0.31%	54.70%	0.69%	48.81%
N	57,667	57,667	41,515	41,515	16,152	16,152

Table 4.3: Continued

Panel B: Determinants of analysts' precision for the AFE model

	Dependent variable: $\ln\lvert a_i/\sigma_v\rvert$					
	(1)	(2)	(3)	(4)	(5)	(6)
Sample	All	All	Optimists	Optimists	Pessimists	Pessimists
Intercept	-1.190***	-0.858***	-1.062***	-0.740***	-1.539***	-1.548***
	(0.033)	(0.076)	(0.034)	(0.072)	(0.080)	(0.285)
ln(companies)	0.026**	-0.022**	0.027***	-0.010	0.020	-0.057**
	(0.010)	(0.010)	(0.010)	(0.010)	(0.023)	(0.025)
ln(experience)	-0.025***	0.012	-0.045***	0.000	0.030	0.012
	(0.009)	(0.008)	(0.010)	(0.009)	(0.020)	(0.017)
ln(industries)	-0.033***	-0.003	-0.005	-0.004	-0.133***	-0.017
	(0.009)	(0.009)	(0.009)	(0.010)	(0.020)	(0.021)
ln(broker_size)	-0.031***	-0.021***	-0.039***	-0.027***	-0.001	-0.008
	(0.005)	(0.005)	(0.006)	(0.005)	(0.012)	(0.010)
Firm fixed effects	No	Yes	No	Yes	No	Yes
R^2	0.12%	34.16%	0.23%	39.11%	0.35%	44.63%
N	58,567	58,567	42,414	42,414	16,153	16,153

are more precise if they follow less firms, more industries, and if they are older and work for a larger broker. When we control for firm fixed effects in Specification (2), only the size of the broker remains highly significant. Broker size is likely to proxy for reputation, and Fang and Yasuda (2009) also find in fixed effects regressions that accuracy is positively related to reputation. Interestingly, analyst experience that was highly significant in Specification (1) is insignificant in Specification (2). This implies that more experienced analysts are not more precise but that they follow firms where analysts are more precise on average. A potential reason is that young analysts start with small firms that are more difficult to forecast and later switch to bigger firms with a better information environment. Likewise, analysts who concentrate on more firms might follow smaller firms that are more difficult to forecast accurately. Also, analysts who follow more industries might concentrate on firms where it is easier to make precise forecasts. The only effect that is not due to such a selection effect is the size of the

broker. This is intuitive, because broker size proxies for analyst expertise and broker reputation.

We next analyze whether these effects are the same for optimistic and pessimistic analysts. In Specifications (3) and (4) in Table 4.3, we run the same regressions for the subsample of optimistic analysts, i.e. where $\Phi^{-1}(q_i) > 0$. In Specifications (5) and (6) we consider the subsample of pessimists where $\Phi^{-1}(q_i) < 0$. It turns out that the effects are not the same in the two subsamples. Once we control for selection effects in Specifications (4) and (6), broker size significantly reduces only optimism but not pessimism. On the other hand, pessimism is lower when the analyst follows fewer firms, but the number of firms is unrelated to optimism.

Table 3, Panel B shows similar results for the AFE model that estimates $a_i = \Phi^{-1}(q_i)\sigma_v$ instead of q_i in the full model. We therefore define precision by $\ln|a_i/\sigma_v|$, which becomes the dependent variable in the regressions in Table 3, Panel B. A comparison between the two panels yields that the two sets of results are very similar. Hence, it is justifiable to use the simpler AFE model to estimate analyst target quantiles.

Altogether, these results are in line with the literature on analyst precision and analyst biases. They show that our estimates of the target probabilities q_i make sense. Beyond these target probabilities, our model also generates forecasts for future earnings and estimates of analyst disagreement and economy-wide uncertainty. These are the topics we now turn to.

4.4 Forecasting earnings

To generate and evaluate forecasts out-of-sample, we adjust our estimation procedure. We start with forecasts for the year 2001 and therefore consider only firms with at least ten years history ending in 2000. In each of the prior years, firms must have issued an earnings announcement and must have received at least two analyst forecasts. We then repeat this process for 2002, 2003, ..., 2008. In this way, we construct nine different samples (one for each year from 2000 to 2008) with between 277 and 399 firms each. Each firm in the nine samples has an out of sample forecast for the next year (2001 to 2009) as described in Equation (4.8). We compare the

forecasts from our full model, $\hat{X}_{T+1}^{full}$, and the AFE model, $\hat{X}_{T+1}^{afe}$, to two benchmarks: the mean of all analyst forecasts for year $T+1$ (the consensus forecast), and the corrected consensus forecast, where we estimate the bias of the consensus forecast within sample (i.e. up to year T) and then deduct this bias from the out-of-sample consensus forecast. If all analysts have the same level of optimism on average and consistently over time, the corrected consensus forecast removes the optimism from the forecast.

Table 4.4 shows descriptive statistics for the forecast errors of the four models for each of the nine years from 2001 to 2009 and for the pooled sample. The forecast error is defined as the difference between the forecast from the beginning of year T and the realized earnings from the end of year T scaled by the stock price from year $T-1$.[5] The table shows that across all years the mean forecast error of our full model is 0.0029 compared to 0.0101 for the consensus forecast and 0.0045 for the corrected consensus forecast, so according to this measure our model estimate improves forecast accuracy. The RMSE yields a similar result. It is 0.0757 for our model compared to 0.0820 for both the corrected and uncorrected consensus forecast. When we consider the median forecast error or the mean absolute forecast error (MAFE), the consensus forecast is slightly better than our model forecasts whereas the corrected consensus forecast comes third.

Table 4.4: Out-of-sample earnings forecasts

This table shows descriptive statistics of the forecast accuracy of four different models: (1) the consensus forecast, (2) the corrected consensus forecast where the bias of the consensus forecast is estimated in sample and deducted from the consensus forecast out-of-sample, (3) the out-of-sample forecast from our full model (see Equation 4.6), and (4) the out-of-sample forecast from the AFE model (see Equation 4.7). The table shows the mean and the 25%, 50%, and 75% quantiles of the forecast error, which is the difference between the realized earnings and the forecast scaled by the price from the last fiscal year end. It also shows the mean absolute forecast error and the root mean-squared error, RMSE. We repeat this analysis for each year from 2001 to 2009 and also show the results for the pooled sample of all years. In the leftmost column, the table also shows the number of firms in the respective sample and the analyst forecast dispersion (the standard deviation of analysts' forecasts) in the respective year, where the standard deviation is calculated for each firm and the average is taken across firms.

[5] Here as everywhere in the paper "year" refers to "fiscal year" which may or may not coincide with the calendar year.

Year (# firms) {forecast std.}	Model	Forecast error				MAFE	RMSE
		Quantiles			Mean		
		25%	50%	75%			
2001-2009	Consensus	-0.0050	0.0001	0.0091	0.0101	0.0237	0.0820
(2,929)	Corr. Cons.	-0.0113	-0.0017	0.0067	0.0045	0.0257	0.0820
{0.192}	Full model	-0.0092	-0.0013	0.0058	0.0029	0.0242	0.0757
	AFE model	-0.0090	-0.0013	0.0057	0.0030	0.0240	0.0747
2001	Consensus	-0.0022	0.0012	0.0153	0.0081	0.0226	0.0439
(304)	Corr. Cons.	-0.0113	-0.0010	0.0092	-0.0006	0.0248	0.0444
{0.183}	Full model	-0.0064	-0.0002	0.0096	0.0004	0.0215	0.0404
	AFE model	-0.0063	-0.0001	0.0094	0.0006	0.0213	0.0403
2002	Consensus	-0.0004	0.0049	0.0231	0.0191	0.0250	0.0573
(277)	Corr. Cons.	-0.0052	0.0010	0.0169	0.0121	0.0244	0.0531
{0.126}	Full model	-0.0028	0.0023	0.0178	0.0114	0.0231	0.0533
	AFE model	-0.0030	0.0021	0.0178	0.0115	0.0229	0.0529
2003	Consensus	-0.0040	0.0003	0.0079	0.0044	0.0161	0.0382
(287)	Corr. Cons.	-0.0132	-0.0027	0.0046	-0.0033	0.0190	0.0393
{0.154}	Full model	-0.0102	-0.0014	0.0041	-0.0054	0.0195	0.0559
	AFE model	-0.0099	-0.0018	0.0039	-0.0041	0.0183	0.0410
2004	Consensus	-0.0090	-0.0013	0.0045	-0.0016	0.0197	0.0549
(316)	Corr. Cons.	-0.0170	-0.0051	0.0021	-0.0082	0.0229	0.0594
{0.153}	Full model	-0.0163	-0.0045	0.0008	-0.0123	0.0229	0.0665
	AFE model	-0.0164	-0.0049	0.0009	-0.0126	0.0231	0.0684
2005	Consensus	-0.0119	-0.0016	0.0029	-0.0038	0.0182	0.0439
(319)	Corr. Cons.	-0.0212	-0.0051	0.0012	-0.0097	0.0204	0.0444
{0.161}	Full model	-0.0180	-0.0040	0.0011	-0.0093	0.0208	0.0470
	AFE model	-0.0173	-0.0040	0.0012	-0.0091	0.0204	0.0463
2006	Consensus	-0.0080	-0.0017	0.0033	-0.0011	0.0158	0.0332
(348)	Corr. Cons.	-0.0141	-0.0037	0.0023	-0.0077	0.0182	0.0410
{0.144}	Full model	-0.0135	-0.0034	0.0020	-0.0072	0.0169	0.0329
	AFE model	-0.0137	-0.0034	0.0020	-0.0073	0.0169	0.0331
2007	Consensus	-0.0064	-0.0009	0.0059	0.0027	0.0155	0.0341
(379)	Corr. Cons.	-0.0108	-0.0024	0.0041	-0.0011	0.0187	0.0373
{0.219}	Full model	-0.0103	-0.0028	0.0032	-0.0030	0.0165	0.0339
	AFE model	-0.0104	-0.0027	0.0032	-0.0029	0.0163	0.0337
2008	Consensus	-0.0042	0.0001	0.0088	0.0117	0.0223	0.0630
(399)	Corr. Cons.	-0.0074	-0.0006	0.0089	0.0091	0.0244	0.0640
{0.194}	Full model	-0.0066	-0.0010	0.0076	0.0076	0.0232	0.0620
	AFE model	-0.0066	-0.0010	0.0074	0.0077	0.0230	0.0618

2009	Consensus	-0.0017	0.0059	0.0282	0.0567	0.0627	0.2145
(300)	Corr. Cons.	-0.0034	0.0047	0.0257	0.0534	0.0614	0.2113
{0.392}	Full model	-0.0023	0.0042	0.0212	0.0470	0.0573	0.1838
	AFE model	-0.0023	0.0045	0.0207	0.0469	0.0570	0.1834

When we investigate the mean forecast errors for each year separately, we see that our model forecasts beat the consensus forecasts in years 2001, 2002, 2008, and 2009 while the consensus forecast is better than our model forecast for the years 2003 to 2006. In 2007 both models are equally accurate. The table also shows the analyst forecast dispersion $D_t = \frac{1}{K}\sum_{j=1}^{K}\frac{1}{N-1}\sum_{i=1}^{N}\left(F_{i,j,t}-\overline{F}_{.,j,t}\right)^2$ in the leftmost column: we first calculate the standard deviation across analysts' forecasts $F_{i,j,t}$ for each firm j and then average these estimates across firms. This measure of uncertainty is often referred to in the literature as "analyst disagreement". It is higher in 2001, 2007, 2008, and 2009 than in the period from 2002 to 2006. Hence, our model yields more accurate earnings forecasts in those years where uncertainty is high.

The forecast errors of the AFE model are very similar to the errors of the full model. Altogether we therefore conclude that the consensus forecast can be considerably improved by taking into account the individual biases of different analysts. The AFE model is a tractable model that generates the same improvements as the more sophisticated full model.

Table 4.5 displays regressions of realized EPS on the four different forecasts across all 2,929 firms in the pooled sample. Specifications (1) to (3) show that our model can explain 54.5% of the variation in EPS, while the consensus forecast can explain only 48.3% and the corrected consensus forecast 47.0%. In Specifications (4) and (5), the coefficients on the consensus forecast and, respectively, the corrected consensus forecast become insignificant when we also add our model forecast to the regression. In contrast to the (corrected) consensus forecast, our model forecast remains significant.

Specifications (6) to (8) investigate the predictive power of the AFE model in a similar way. The APE forecasts explain 55.0% of the variation in EPS, i.e. slightly more than the full model. Again the (corrected) consensus forecast becomes insignificant when we also include the AFE

Table 4.5: Regressions of realized on forecasted earnings

This table displays the results of five regressions of realized EPS on four forecasts: (1) the consensus forecast, (2) the corrected consensus forecast where the bias of the consensus forecast is estimated in sample and deducted from the consensus forecast out-of-sample, (3) the out-of-sample forecast from our model (see equation (6)), and (4) the out-of-sample forecast from the AFE model (see equation (7)). The regressions are done in the pooled sample of 2,929 firm-year observations from 2001 to 2009. Huber-White standard errors are shown in parentheses. ***, **, and * denote significance at the, respectively, 1%, 5%, and 10% level. The table also shows the unadjusted R^2 and the p-value of the F-test of the hypothesis that the slope of the regression equals one and the intercept equals zero.

	Dependent variable: EPS							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Intercept	-0.020	-0.010	-0.005	-0.002	-0.001	-0.006	0.004	0.002
	(0.019)	(0.016)	(0.013)	(0.013)	(0.010)	(0.013)	(0.013)	(0.009)
Consensus	1.172***			-0.164			-0.529	
	(0.307)			(0.627)			(0.639)	
Cor. Cons.		1.097***			-0.350			-0.782
		(0.277)			(0.628)			(0.604)
Full Model			1.032***	1.161*	1.324**			
			(0.226)	(0.611)	(0.651)			
AFE Model						1.051***	1.475**	1.714***
						(0.231)	(0.620)	(0.624)
R^2_{adj}	48.3%	47.0%	54.5%	54.6%	55.0%	55.8%	56.5%	57.4%
p-value of F-test	0.00%	0.26%	6.56%			5.18%		
N	2,929	2,929	2,929	2,929	2,929	2,929	2,929	2,929

forecast into the regression.

In a good forecast regression, the intercept should be close to zero and the slope coefficient close to one. In Table 4.5, we use an F-test to test this hypothesis for each of the four forecasts. We find that this hypothesis is rejected with a p-value smaller than 0.005% for the consensus forecast and a p-value of 0.26% for the corrected consensus forecast. In contrast, the p-value is 6.6% for our full model forecast and 5.18% for the AFE forecast, which indicates that our model (and to a lesser extent the AFE model) produces better, i.e., less biased forecasts.

4.5 Disagreement and uncertainty

Our model produces two estimates of uncertainty. First, the economy-wide uncertainty σ_ν is the standard deviation of the noise that cannot be forecasted even if all information in the economy is combined. Second, analyst disagreement σ_ε is the standard deviation of the noise in each analyst's perception of the location of the earnings distribution. The larger σ_ε the more analysts disagree about the location of the earnings distribution. In contrast, σ_ν determines the dispersion of the distribution as perceived by analysts. Table 4.2 displays descriptive statistics for our estimates across the 917 firms in our sample. Median disagreement (σ_ε) is 4.9% and much smaller than median uncertainty (σ_ν) which is 33.2%. For uncertainty, we also have a large outlier with a standard deviation of 1,641. Table 4.6 shows the correlations of our estimates $\widehat{\sigma}_\varepsilon^{full}$ and $\widehat{\sigma}_\varepsilon^{afe}$ for analyst disagreement and $\widehat{\sigma}_\nu^{full}$ and $\widehat{\sigma}_\nu^{afe}$ for economy-wide uncertainty with three other measures that have been used in the literature to measure uncertainty or analyst disagreement. For each of the 917 firms in our sample, we calculate the other measures for the last year of the estimation period and report correlations across these 917 firms in Table 4.6. The table shows Pearson correlations with p-values in parentheses above the diagonal and Spearman rank correlations below the diagonal.

The first measure is the analyst forecast dispersion $D_{j,t} = \frac{1}{N-1}\sum_{i=1}^{N}\left(F_{i,j,t} - \overline{F}_{.,j,t}\right)^2$ which is often used as proxy for analyst disagreement in the literature. However, it is widely acknowl-

Table 4.6: Correlations of different measures of uncertainty and disagreement

This table displays correlations between several measures and estimates of uncertainty and disagreement across firms. We consider the estimator σ_ε of our full model and the APE model, the economy-wide uncertainty σ_v of our full model and the APE model, the standard deviation of analyst forecasts, Amihud's (Amihud, 2002) measure of illiquidity, and the bid-ask spread. The last three measures (Std.dev. AF, Amihud, and Bid-Ask) are estimated from the last year of the sample that we used to estimate σ_ε and σ_v. The table shows Pearson correlations above the diagonal and Spearman rank correlations below the diagonal. P-values are shown in parentheses.

# Obs: 716	$\widehat{\sigma}_\varepsilon^{full}$	$\widehat{\sigma}_v^{full}$	$\widehat{\sigma}_\varepsilon^{afe}$	$\widehat{\sigma}_v^{afe}$	Std.dev. AF	Amihud	Bid-Ask
$\widehat{\sigma}_\varepsilon^{full}$	1.00	0.07	0.91	0.79	0.74	0.10	0.01
	(0.00)	(0.05)	(0.00)	(0.00)	(0.00)	(0.01)	(0.74)
$\widehat{\sigma}_v^{full}$	0.73	1.00	0.07	0.10	0.04	0.00	0.01
	(0.00)	(0.00)	(0.06)	(0.01)	(0.26)	(0.95)	(0.87)
$\widehat{\sigma}_\varepsilon^{afe}$	0.97	0.76	1.00	0.81	0.82	0.14	0.01
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.78)
$\widehat{\sigma}_v^{afe}$	0.80	0.94	0.80	1.00	0.48	0.14	0.01
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.88)
Std.dev. AF	0.69	0.59	0.70	0.63	1.00	0.05	0.01
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.18)	(0.78)
Amihud	0.09	0.14	0.14	0.17	0.09	1.00	-0.02
	(0.01)	(0.00)	(0.00)	(0.00)	(0.02)	(0.00)	(0.52)
Bid-Ask	0.10	0.05	0.08	0.07	0.15	-0.46	1.00
	(0.01)	(0.17)	(0.03)	(0.06)	(0.00)	(0.00)	(0.00)

edged that this measure also captures uncertainty that is not related to analyst disagreement (see Barry and Jennings (1992) and Barron et al. (1998)). From Equation (4.3), the forecast $F_{i,t}$ also depends on uncertainty σ_v if the analyst's target quantile $\Phi^{-1}(q_i)$ is nonzero. Therefore, we expect that both of our estimates $\widehat{\sigma}_\varepsilon$ and $\widehat{\sigma}_v$ are correlated with analyst forecast dispersion.

The second measure is Amihud's (Amihud, 2002) measure of illiquidity. For each day, we calculate the ratio of the absolute stock return of firm j and its dollar volume and then average this ratio across all days of the year. Our final measure is the average bid-ask-spread that is another measure of illiquidity. According to standard arguments from the market microstructure literature, illiquidity is mostly caused by asymmetric information but not (or to a much lesser extent) by economy wide uncertainty. We therefore expect that $\widehat{\sigma}_\varepsilon$ and $\widehat{\sigma}_v$ are positively corre-

lated with Amihud's measure and with the bid-ask spread, but that the correlations are stronger with $\widehat{\sigma}_\varepsilon$ than with $\widehat{\sigma}_v$.

When we consider Spearman correlations below the diagonal, we find that analyst disagreement $\widehat{\sigma}_\varepsilon$ is positively correlated with Amihud's illiquidity measure and with the bid-ask spread. It is also highly positively correlated with analyst dispersion. The economy-wide uncertainty $\widehat{\sigma}_v$ is also positively correlated with these three measures, but the correlation with analyst dispersion is smaller than for $\widehat{\sigma}_\varepsilon$. Pearson correlations above the diagonal in general corroborate these findings, except for the bid-ask spread that is not significantly related to any other measure according to the Pearson correlations. Also, for the estimator of the full model, $\widehat{\sigma}_v^{full}$, Pearson correlations are close to zero whereas Spearman correlations are positive and significant. Except for the last effect, results are rather similar for the full model and the AFE model. Hence, Table 4.6 also suggests that the simpler AFE model can be used without much loss of precision.

Nederlandse Samenvatting (Summary in Dutch)

Deze dissertatie omvat drie onderzoeken die betrekking hebben op verschillende gebieden. Het eerste onderzoek, opgenomen in hoofdstuk 2, benadert het probleem van het trekken van conclusies uit populaties van ondernemingen die in omvang verschillen. Dit zogenaamde schaalprobleem leidt vaak tot onjuiste conclusies in onderzoek op het gebied van accounting en finance.

Het tweede onderzoek, opgenomen in hoofdstuk 3, bestudeert ondernemingen die hebben gekozen voor de rechtsvorm "Societas Europaea" (Europese Vennootschap); dat is een nieuwe rechtsvorm op basis van wetgeving in de Europese Unie. In dit onderzoek wordt in het bijzonder ingegaan op de vraag waar en wanneer ondernemingen overgaan op de nieuwe rechtsvorm en wat de invloed is van de doorgevoerde veranderingen op de aandeelhouderswaarde van de ondernemingen.

Het laatste onderzoek, opgenomen in hoofdstuk 4, is gericht op de winstvoorspellingen van financieel analisten; hierbij worden financieel analisten ingedeeld in twee categorieën: optimisten en pessimisten. Op basis van bepaalde kenmerken van financieel analisten worden zij ingedeeld in de categorie optimist dan wel pessimist. Het onderzoek toont aan dat betere voorspellingen worden gegenereerd als er geen optimisten of pessimisten zouden zijn, en in plaats daarvan alle financieel analisten zonder vooringenomenheid (vertekening) zouden voorspellen.

Op het gebied van finance en accounting willen onderzoekers vaak economische gevol-

gen onderkennen die onafhankelijk zijn van de omvang van de ondernemingen in de onderzoekspopulatie.Veel economische verschijnselen zijn echter wel gerelateerd aan de omvang van ondernemingen: grote ondernemingen genereren hogere resultaten en hebben daarom hogere marktwaarden, grote ondernemingen genereren meer “accruals”. Omdat schaaleffecten zo vaak voorkomen is het belangrijk om hiervoor te corrigeren.

In de gangbare benaderingen wordt verondersteld dat variabelen naar evenredigheid op omvang worden geschaald en dat daardoor alle variabelen die beïnvloed worden door omvang worden gedeeld door een factor die geldt als “proxy” voor de omvang van de onderneming.

Naast de veronderstelling dat omvang evenredig is aan de andere variabelen, kan deze benadering leiden tot extreme waarden als de noemer nadert tot nul. Hoofdstuk 2 stelt een eenvoudige transformatie voor die het schaalprobleem verandert in een probleem van niet opgenomen, gecorreleerde variabelen. Hoofdstuk 2 laat zien dat deze transformatie leidt tot resultaten die vanuit economisch oogpunt intuïtief juist zijn, terwijl de traditionele benadering vaak leidt tot resultaten die niet-intuïtief juist zijn.

De door mij voorgestelde transformatie leidt tot betere statistische resultaten dan de traditionele benadering van schatting van coëfficiënten in een regressieanalyse met behulp van de methode van de kleinste kwadraten (“ordinary least squares”), hetgeen de meest gebruikte schattingstechniek is in economische studies.

In een setting, waarin de marktkapitalisatie wordt voorspeld met twee cijfers uit de financiële verslaggeving, namelijk winst en boekwaarde van het eigen vermogen, heeft de traditionele benadering een “root mean squared error”, die ongeveer 2,5 keer groter is dan de “root mean squared error” van de door mij voorgestelde transformatie.

Hoofdstuk 3 bestudeert ondernemingen die hebben gekozen voor de rechtsvorm Societas Europaea (SE) (Europese Vennootschap). De SE is een nieuwe rechtsvorm, ontstaan in 2001, die gedeeltelijk onder de wetgeving van de Europese Unie valt. De Europese Commissie creëerde de SE om het voor de Europese ondernemingen gemakkelijker te maken om hun vestigingsplaats in de EU te wijzigen,met andere ondernemingen in de EU te fuseren, en om

meer flexibiliteit te bewerkstelligen in de regeling van medezeggenschap van werknemers en de samenstelling van het bestuur.

Hoewel de SE enerzijds aandeelhouderswaarde zou kunnen creëren door fusies die minder kosten met zich meebrengen, door een efficiëntere organisatie van bedrijfsonderdelen of door een meer op de onderneming toegesneden regeling van de medezeggenschap van werknemers, is het anderzijds ook mogelijk dat de SE aandeelhouderswaarde vernietigt als managers de SE gebruiken om hun eigen belangen na te streven ten koste van de belangen van de aandeelhouders. Hoofdstuk 3 bestudeert hoe SEs waarde creëren en vernietigen.

Hoewel ik geen significante abnormale rendementen vind als gevolg van wijziging van de medezeggenschapsverhoudingen door de keuze van de rechtsvorm van de SE, concludeer ik wel dat ondernemingen in gereguleerde bedrijfstakken een hoger abnormaal rendement hebben van 2,7 procentpunten dan ondernemingen in niet-gereguleerde bedrijfstakken.

Daartegenover staat dat ondernemingen die hun managementstructuur van twee lagen (managementlaag en toezichtlaag) naar één laag (bestuurslaag) veranderen 3,7 procentpunten lagere abnormale rendementen hebben dan ondernemingen die hun managementstructuur niet veranderen. De conclusies zijn in overeenstemming met de visie dat de SE waarde vernietigt als managers de SE gebruiken om het toezicht op het bestuur af te zwakken door de toezichtlaag af te schaffen.

Daar staat tegenover dat de flexibiliteit die de SE heeft om haar vestigingsplaats te wijzigen waardevol is voor ondernemingen die in gereguleerde bedrijfstakken opereren, d.w.z. bedrijfstakken waarbij de winstgevendheid afhangt van vergunningen of subsidies van de overheid. Hoofdstuk 3 concludeert ook dat ondernemingen die overgaan op de rechtsvorm SE al voordat zij hun rechtsvorm wijzigden slechter presteerden dan hun tegenhangers in de bedrijfstak.

Hoofdstuk 4 bestudeert het gedrag van financieel analisten. Ingolf Dittmann en ik schatten een model waarin financieel analisten steeds verkeerde voorspellingen doen. Financieel analisten die steeds te hoge winsten voorspellen zijn optimisten en financieel analisten die steeds te lage opbrengsten voorspellen zijn pessimisten.

Ons model levert empirisch bewijs dat 73 % van de financieel analisten optimisten zijn en dat 27 % van de financieel analisten pessimisten zijn. We concluderen dat optimisten minder optimistisch zijn als ze voor grotere effectenmakelaars werken. We hebben geen bewijs gevonden dat ervaring van financieel analisten een verklaring biedt voor hun optimisme of pessimisme. Als een praktisch gevolg van onze conclusie kunnen we een winstvoorspelling doen waarin wordt gecorrigeerd voor optimisme en pessimisme in individuele voorspellingen.

Deze voorspelling is nauwkeuriger dan conventionele voorspellingen zoals de consensusvoorspelling (het gemiddelde van alle individuele voorspellingen). Onze voorspelling kan ook meer variatie in de winst per aandeel verklaren dan conventionele voorspellingen.

Bibliography

Adams, R. B. and Ferreira, D. (2007), 'A theory of friendly boards', *The Journal of Finance* **62**(1), 217–250.

Adams, R. B., Hermalin, B. E. and Weisbach, M. S. (2010), 'The Role of Boards of Directors in Corporate Governance: A Conceptual Framework and Survey', *Journal of Economic Literature* **48**, 58–107.

Addison, J. T. and Schnabel, C. (2011), 'Worker directors: A german product that did not export?', *Industrial Relations: A Journal of Economy and Society* **50**(2), 354–374.

Ahern, K. R. and Dittmar, A. (2010), 'The Changing of the Boards: The Value Effect of a Massive Exogenous Shock', *SSRN eLibrary* .

Amihud, Y. (2002), 'Illiquidity and stock returns: cross-section and time-series effects', *Journal of Financial Markets* **5**(1), 31 – 56.

Ataullah, A., Rhys, H. and Tippett, M. (2009), 'Non-linear equity valuation', *Accounting & Business Research* **39**(1), 57 – 73.

Baker, M., Stein, J. C. and Wurgler, J. (2003), 'When Does the Market Matter? Stock Prices and the Investment of Equity-Dependent Firms', *The Quarterly Journal of Economics* **118**(3), pp. 969–1005.

Barron, O. E., Kim, O., Lim, S. C. and Stevens, D. E. (1998), 'Using analysts' forecasts to measure properties of analysts' information environment', *The Accounting Review* **73**(4), 421–433.

Barry, C. B. and Jennings, R. H. (1992), 'Information and diversity of analyst opinion', *The Journal of Financial and Quantitative Analysis* **27**(2), pp. 169–183.

Barth, M. E. and Clinch, G. (2009), 'Scale Effects in Capital Markets-Based Accounting Research', *Journal of Business Finance & Accounting* **36**(3-4), 253–288.

Barth, M. E. and Kallapur, S. (1996), 'The Effects of Cross-Sectional Scale Differences on Regression Results in Empirical Accounting Research', *Contemporary Accounting Research* **13**(2), 527–567.

Baums, T. (1999), 'Corporate contracting around defective regulations: The Daimler-Chrysler case', *Journal of Institutional and Theoretical Economics* **155**, 119 – 127.

Bebchuk, L. A. and Cohen, A. (2003), 'Firms' decision where to incorporate', *Journal of Law and Economics* **XLVI**, 382 – 425.

Bondt, W. F. M. D. and Thaler, R. H. (1990), 'Do security analysts overreact?', *The American Economic Review* **80**(2), pp. 52–57.

Brown, S., Lo, K. and Lys, T. (1999), 'Use of R^2 in accounting research: measuring changes in value relevance over the last four decades', *Journal of Accounting and Economics* **28**, 83 – 115.

Burbidge, J. B., Magee, L. and Robb, A. L. (1988), 'Alternative Transformations to Handle Extreme Values of the Dependent Variable', *Journal of the American Statistical Association* **83**(401), 123–127.

Burgstahler, D. C. and Dichev, I. D. (1997), 'Earnings, Adaptation and Equity Value', *The Accounting Review* **72**(2), 187 – 215.

Butler, K. C. and Lang, L. H. P. (1991), 'The forecast accuracy of individual analysts: Evidence of systematic optimism and pessimism', *Journal of Accounting Research* **29**(1), 150 –156.

Byrd, J. W. and Hickman, K. A. (1992), 'Do outside directors monitor managers? : Evidence from tender offer bids', *Journal of Financial Economics* **32**(2), 195 – 221.

Campa, J. M. and Hernando, I. (2004), 'Shareholder Value Creation in European M & As', *European Financial Management* **10**(1), 47 – 81.

Christie, A. A. (1987), 'On cross-sectional analysis in accounting research', *Journal of Accounting and Economics* **9**(3), 231 – 258.

Clatworthy, M. A., Peel, D. A. and Pope, P. F. (2005), 'Are Analysts' Loss Functions Asymmetric?', *SSRN eLibrary* .

Cleveland, W. S., Devlin, S. J. and Grosse, E. (1988), 'Regression By Local Fitting. Methods, Properties, and Computational Algorithms', *Journal of Econometrics* **37**, 87 – 114.

Coles, J. L., Daniel, N. D. and Naveen, L. (2008), 'Boards: Does one size fit all', *Journal of Financial Economics* **87**(2), 329 – 356.

Collins, D. W., Maydew, E. L. and Weiss, I. S. (1997), 'Changes in the value relevance of earnings and book value over the past forty years', *Journal of Accounting and Economics* **24**, 39 – 67.

Core, J. E., Holthausen, R. W. and Larcker, D. F. (1999), 'Corporate governance, chief executive officer compensation, and firm performance', *Journal of Financial Economics* **51**(3), 371 – 406.

Corrado, C. J. (1989), 'A nonparametric test for abnormal security-price performance in event studies', *Journal of Financial Economics* **23**, 385 – 395.

Corrado, C. J. and Zivney, T. L. (1992), 'The specification and power of the sign test in event study hypothesis tests using daily stock returns', *Journal of Financial and Quantitative Analysis* **27**(3), 465 – 478.

Cotter, J. F., Shivdasani, A. and Zenner, M. (1997), 'Do independent directors enhance target shareholder wealth during tender offers?', *Journal of Financial Economics* **43**(2), 195 – 218.

Cowen, A., Groysberg, B. and Healy, P. (2006), 'Which types of analyst firms are more optimistic?', *Journal of Accounting and Economics* **41**(1-2), 119 – 146.

Darrough, M. and Ye, J. (2007), 'Valuation of loss firms in a knowledge-based economy', *Review of Accounting Studies* **12**, 61 – 93.

Das, S. and Lev, B. (1994), 'Nonlinearity in the Returns-Earnings Relation: Tests of Alternative Specifications and Explanations', *Contemporary Accounting Research* pp. 353–380.

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

Dechow, P. M., Hutton, A. P. and Sloan, R. G. (2000), 'The relation between analysts' forecasts of long-term earnings growth and stock price performance following equity offerings*', *Contemporary Accounting Research* **17**(1), 1–32.

Dugar, A. and Nathan, S. (1995), 'The Effect of Investment Banking Relationships on Financial Analysts' Earnings Forecasts and Investment Recommendations', *Contemporary Accounting Research* **12**(1), 131 – 160.

Easton, P. D. and Sommers, G. A. (2003), 'Scale and the scale effect in market-based accounting research', *Journal of Business Finance & Accounting* **30**(1), 25 – 55.

Eidenmüller, H. G., Engert, A. and Hornuf, L. (2010), 'How Does the Market React to the Societas Europaea?', *European Business Organization Law Review* **11**, 35–50.

Ernst & Young (2009), 'Study on the operation and the impacts of the Statute for a European Company (SE) - 2008/S 144-192482'.

Faleye, O., Mehrotra, V. and Morck, R. (2006), 'When Labor Has a Voice in Corporate Governance', *Journal of Financial and Quantitative Analysis* **41**(03), 489–510.

Fang, L. and Yasuda, A. (2009), 'The Effectiveness of Reputation as a Disciplinary Mechanism in Sell-Side Research', *Review of Financial Studies* **22**(9), 3735–3777.

Feltham, G. A. and Ohlson, J. A. (1995), 'Valuation and Clean Surplus Accounting for Operating and Financial Activities', *Contemporary Accounting Research* pp. 689 – 731.

Fich, E. M. and Shivdasani, A. (2006), 'Are Busy Boards Effective Monitors?', *The Journal of Finance* **61**(2), 689–724.

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

Francis, J. and Schipper, K. (1999), 'Have financial statements lost their relevance?', *Journal of Accounting Research* **37**(2), 319 – 352.

Friesen, G. and Weller, P. A. (2006), 'Quantifying cognitive biases in analyst earnings forecasts', *Journal of Financial Markets* **9**(4), 333 – 365.

García Lara, J. M., Grambovas, C. A. and Walker, M. (2009), 'On the Development of an Efficient Deflator for the Estimation of Accounting-Based Valuation Models', *SSRN eLibrary* .

Goergen, M. and Renneboog, L. (2004), 'Shareholder Wealth Effects of European Domestic and Cross-border Takeover Bids', *European Financial Management* **10**(1), 9 – 45.

Gorton, G. and Schmid, F. (2004), 'Capital, labor, and the firm: A study of German codetermination', *Journal of the European Economic Association* **2**(5), 863 – 905.

Gu, Z. (2007), 'Across-sample Incomparability of R^2s and Additional Evidence on Value Relevance Changes Over Time', *Journal of Business Finance & Accounting* **34**(7-8), 1073–1098.

Hand, J. R. (2003), *Profits, Losses, and the Nonlinear Pricing of Internet Stocks*, Oxford Management Readers, Oxford University Press, chapter 10, pp. 248 – 268.

Handelsblatt (2007), 'VW, MAN and Scania could resume dialogue'.

Hayn, C. (1995), 'The information content of losses', *Journal of Accounting and Economics* **20**, 125 – 153.

Hermalin, B. E. and Weisbach, M. S. (1991), 'The effects of board composition and direct incentives on firm performance', *Financial Management* **20**(4), pp. 101–112.

Hermalin, B. E. and Weisbach, M. S. (2003), 'Boards of directors as an endogenously determined institution: A survey of the economic literature', *Economic Policy Review* **9**(1), 7 – 26.

Hoffmann, J. (1999), 'Die Bildung der Aventis S.A. - ein Lehrstück des europäischen Gesellschaftsrechts', *Neue Zeitschrift für Gesellschaftsrecht* **22**, 1077 – 1090.

Holthausen, R. W. and Watts, R. L. (2001), 'The relevance of the value-relevance literature for financial accounting standard setting', *Journal of Accounting and Economics* **31**, 3 – 75.

Hong, H. and Kubik, J. D. (2003), 'Analyzing the analysts: Career concerns and biased earnings forecasts', *The Journal of Finance* **58**(1), pp. 313–351.

Hwang, B.-H. and Kim, S. (2009), 'It pays to have friends', *Journal of Financial Economics* **93**(1), 138 – 158.

Jackson, A. R. (2005), 'Trade generation, reputation, and sell-side analysts', *The Journal of Finance* **60**(2), pp. 673–717.

Jensen, M. C. and Meckling, W. H. (1979), 'Rights and production functions: An application to labor-managed firms and codetermination', *The Journal of Business* **52**(4), 469–506.

Jenter, D. C. and Kanaan, F. (2008), 'Ceo turnover and relative performance evaluation', *SSRN eLibrary* .

Kaplan, S. (1994), 'Top executives, turnover, and firm performance in Germany', *Journal of Law, Economics, and Organization* **10**(1), 142 – 159.

Kothari, S. P. and Zimmerman, J. L. (1995), 'Price and return models', *Journal of Accounting and Economics* **20**(2), 155 – 192.

Landsman, W. R. and Magliolo, J. (1988), 'Cross-Sectional Capital Market Research and Model Specification', *The Accounting Review* **63**(4), 586–604.

Lenoir, N. (2007), The Societas Europaea or SE. The new European company. Commissioned by the French Minister of Justice.

Lev, B. and Sunder, S. (1979), 'Methodological issues in the use of financial ratios', *Journal of Accounting and Economics* **1**(3), 187 – 210.

Lewellen, W. G. and Badrinath, S. G. (1997), 'On the measurement of Tobin's q', *Journal of Financial Economics* **44**(1), 77 – 122.

Lim, T. (2001), 'Rationality and analysts' forecast bias', *The Journal of Finance* **56**(1), pp. 369–385.

Ljungqvist, A., Malloy, C. and Marston, F. (2009), 'Rewriting history', *The Journal of Finance* **64**(4), 1935–1960.

Lo, K. (2004), 'The Effects of Scale Differences on Inferences in Accounting Research: Coefficient Estimates, Tests of Incremental Association, and Relative Value Relevance', *SSRN eLibrary* .

MacKinlay, A. C. (1997), 'Event studies in economics and finance', *Journal of Economic Literature* **35**(1), 13 –39.

MacKinnon, J. G. and Magee, L. (1990), 'Transforming the Dependent Variable in Regression Models', *International Economic Review* **31**(2), 315–339.

Markov, S. and Tan, M.-Y. (2006), Loss function asymmetry and forecast optimality: Evidence from individual analysts' forecasts.

Matsumoto, D. A. (2002), 'Management's incentives to avoid negative earnings surprises', *The Accounting Review* **77**(3), pp. 483–514.

McCullagh, P. and Nelder, J. (1989), *Generalized Linear Models*, number 37 *in* 'Monographs on Statistics and Applied Probability', 2 edn, Chapman & Hall.

Morck, R., Shleifer, A. and Vishny, R. W. (1988), 'Management ownership and market valuation: An empirical analysis', *Journal of Financial Economics* **20**, 293 – 315. The Distribution of Power Among Corporate Managers, Shareholders, and Directors.

Nguyen, B. D. and Nielsen, K. M. (2010), 'The value of independent directors: Evidence from sudden deaths', *Journal of Financial Economics* **98**(3), 550 – 567.

Ohlson, J. A. (1995), 'Earnings, Book Values, and Dividends in Equity Valuation', *Contemporary Accounting Research* **11**(2), 661 – 687.

Payne, J. L. and Thomas, W. B. (2003), 'The implications of using stock-split adjusted i/b/e/s data in empirical research', *The Accounting Review* **78**(4), 1049–1067.

Rodriguez, M. d. G. (2007), Financial analysts' incentives and forecast biases.

Rosenstein, S. and Wyatt, J. G. (1990), 'Outside directors, board independence, and shareholder wealth', *Journal of Financial Economics* **26**(2), 175 – 191.

Shivdasani, A. and Yermack, D. (1999), 'Ceo involvement in the selection of new board members: An empirical analysis', *The Journal of Finance* **54**(5), pp. 1829–1853.

Stengel, A. (2002), Zusammenführung über die Grenze, *in* J. Semler and R. Volhard, eds, 'Arbeitshandbuch für Unternehmensübernahmen', Vol. 1, Franz Vahlen, pp. 876 – 912.

Storm, P. (2006), The European Company, *in* D. van Gerven and P. Storm, eds, 'The European Company', Vol. I, Cambridge University Press.

Strauss-Kahn, V. and Vives, X. (2009), 'Why and where do headquarters move?', *Regional Science and Urban Economics* **39**(2), 168–186.

The Economist (2009), 'A stacked deck: Recalcitrant European governments refuse to open their gambling markets'.

Tippett, M. and Yilmaz, F. (2002), 'Residual Income, Reversibility and the Valuation of Equity', *Bristish Accounting Review* **34**, 141 – 165.

Tobin, J. and Brainard, W. (1977), *Asset Markets and the Cost of Capital*, North-Holland, chapter 11, pp. 235–262.

Wang, C. and Xie, F. (2009), 'Corporate Governance Transfer and Synergistic Gains from Mergers and Acquisitions', *Review of Financial Studies* **22**(2), 829–858.

wei Lin, H. and McNichols, M. F. (1998), 'Underwriting relationships, analysts' earnings forecasts and investment recommendations', *Journal of Accounting and Economics* **25**(1), 101 – 127.

Weisbach, M. S. (1988), 'Outside directors and ceo turnover', *Journal of Financial Economics* **20**, 431 – 460. The Distribution of Power Among Corporate Managers, Shareholders, and Directors.

Ye, J. (2007), 'Price Models and the Value Relevance of Accounting Information', *SSRN eLibrary* .

Yermack, D. (1996), 'Higher market valuation of companies with a small board of directors', *Journal of Financial Economics* **40**(2), 185 – 211.

Zhang, G. (2000), 'Accounting Information, Capital Investment Decesions, and Equity Valuation: Theory and Empirical Implications', *Journal of Accounting Research* **38**(2), 271 – 295.