THE DEVELOPMENT OF EARNINGS QUALITY IN GERMANY AND ITS IMPLICATION FOR FURTHER RESEARCH
A quantitative empirical analysis of German listed companies between 1997 and 2006

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Abstract

This paper investigates the development of earnings quality for a sample of 5,817 firm years during the period between 1997 and 2006 using seven different measures (accounting- and market-based). As a result, overall earnings quality of German firms improves over time. However, the measures of timeliness and value relevance indicate a decreasing earnings quality. These findings are tested by taking firm-specific accounting style into consideration using firm fixed effects.

Keywords: earnings quality, persistence, predictability, volatility, accruals quality, earnings management, timeliness, prudence, value relevance

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1 Introduction

This paper addresses the proposition that the quality of financial reporting in Germany has increased in the recent past. The rationale for that proposition is based upon the presupposition that recent regulatory changes such as the mandatory application of IAS/IFRS for capital market-oriented companies and the adoption of certain auditing, enforcement and corporate governance policies[1] should have improved financial reporting quality in Germany. The verification or respective falsification of this proposition is highly important for financial accountants, standard-setters, educators, and auditors, and therefore, has given rise to a number of research and policy initiatives whose common goal is to improve financial reporting by altering the current financial reporting model. The purpose of this paper is not to comment on the specifics of any suggestions for changes in the financial reporting model currently applied but rather to discuss and test some of the empirical implications of the proposition that financial reporting in Germany has improved over time as a consequence of the recent regulatory actions. This study adds empirical discipline to practical debates over the function of financial reporting by putting forward empirical measures to calibrate the quality of reported numbers under the current reporting system. As a result, proposed (or implemented) changes for financial reporting in Germany have a general empirical basis for assessing whether those changes alter the quality of reported numbers.

In order to determine the quality of financial reporting, the accounting literature draws special attention to the examination of the so called "earnings attributes". One reason for this research focus might well be found in the practical relevance of earnings for revenue, net income, EBIT (*earnings before interest and taxes*) or EBITDA (*earnings before interest, taxes, depreciation and amortization*). Earnings are used by the addressees to assess a company's performance (e.g. by residual income[2] approach, or by earnings multiple approach[3]) and they also serve accountants as a means to provide forecast and risk information in the financial report. As a consequence, this study operationalizes the examination of the development of financial reporting quality in Germany in calculating the commonly used earnings attributes measures according to *Francis et al.* (2004). Specifically the research question examined here can be formulated as follows:

Has the earnings quality in Germany as measured by the commonly used earnings attributes increased as a consequence of the recent regulatory changes?

An empirical examination of the development of earnings quality in Germany is useful for the following reason: an empirical examination of earnings quality using a variety of measures for German listed

companies has never been conducted with regard to the development over time. So far, analyses of earnings quality of the annual statements of German listed companies have solely been conducted as comparative studies, focusing on the comparison of the different accounting systems provided by German-GAAP, IFRS and US-GAAP[4]. This, however, has only allowed formulating results regarding the relative difference of the earnings quality of different accounting systems, but not with respect to the development of earnings quality over time. Thus relevant research questions with regard to reasons for the current earnings quality development might have not been identified yet. The study presented here approaches this gap in one's knowledge by examining the current earnings quality development in order to confirm current research activities and derive further relevant research questions with regard to the respective institutional perspective. Note that international accounting research with regard to earnings quality development is numerous but mainly focused on the US-American territory[5]. Concurrently studies by *La Porta et al.* (1998), *Ball et al.* (2000) and *Leuz et al.* (2003) show that a country's legal system can significantly impact companies, and therefore, the quality of the earnings reported[6]. As a consequence the evidence and theories which emerged from the earnings quality studies of case law-affected US-American companies which operate in an environment of strong investor protection rights are only conditionally transferable to a set of, for example, code law-affected German companies in a weak investor protection environment[7].

For the purpose of this study a sample of 688 German listed companies over a period of ten years (1997 to 2006) was used. As a result, overall earnings quality of German listed companies has increased over time. Only with regard to the timeliness and value relevance of earnings a decreasing earnings quality measure was noted. Further research needs identified include a detailed investigation of the reasons for the different earnings quality results of companies with a large market capitalization in comparison to companies with a small market capitalization. In addition, a thorough analysis of the earnings quality development during extreme phases of the business cycle should be examined in more detail.

The remainder of the paper is organized as follows. *Section 2* prepares the terminological ground by defining the commonly used attributes earnings quality is measured by. This will be followed by an overview of the current research situation regarding earnings quality in Germany (*Section 3*). In *Section 4*, the research design of the present study will be introduced and the results for each measure will be presented. Next, robustness results are presented which feature novelties in the research methodology through the use of *firm fixed effects* and *robust standard errors* (*White adjustment*). The contribution will conclude with a critical perspective on the results (*Section 5*) and a short summary of the main theses (*Section 6*).

2 Measures of earnings quality

There are essentially eight measures of earnings quality which are used in the empirical accounting research. These measures reflect accounting-based attributes of earnings on the one hand and market-based attributes on the other[8]. In general, accounting-based measures are defined as *persistence*, *predictability*, *quality of accruals*, *volatility* and *earnings management*. The accounting-based measures are based on cash flows or the earnings themselves as a frame of reference for the assessment of earnings quality. The market-based measures are defined as *value relevance*, *timeliness* and *(conditional) conservatism*. These market-based measures assume a correlation between earnings and stock market prices or stock market returns and come to an assessment of earnings quality by a juxtaposition of these two figures. The division of measures into accounting- and market-based attributes serves specifically to highlight the different functions earnings might serve. Thus, from an accounting-based perspective, earnings serve the accrued distribution of cash flows[9]. The market-based perspective in contrast views earnings as a reflection of economic income as represented by stock market returns[10].

The individual measures of earnings quality are defined as follows: the measure *persistence* is based on the estimated slope coefficient β of a regression model of current earnings ($X_{i,t}$) and future earnings ($X_{i,t+1}$)[11]. *Predictability* is depicted in a time-series analysis by the goodness-of-fit measure R^2, in which case the goodness-of-fit measure R^2 is also determined by a regression model of current earnings ($X_{i,t}$) and future earnings ($X_{i,t+1}$)[12] or future operating cash flows ($CFO_{i,t+1}$)[13]. The *quality of accruals* is derived by the standard error of regression of current operating accruals ($\Delta WC_{i,t}$) according to *Dechow/Dichev* (2002), as well as operating cash flows from the previous period ($CFO_{i,t-1}$), the current period ($CFO_{i,t}$) and the following period ($CFO_{i,t+1}$)[14]. *Volatility* is usually measured as a correlation between changes in accruals (ΔPA_t) and changes in operating cash flows (ΔCFO_t), or alternatively as the median of the firm-specific ratio of the standard error of earnings $\sigma(X_{i,t})$ and the standard error of operating cash flows $\sigma(CFO_{i,t})$[15]. The measure of *earnings management* is usually determined as the median of the ratio of absolute terms of accruals ($|PA_t|$) and absolute terms of operating cash flows ($|CFO_t|$)[16]. The goodness-of-fit measure R^2, resulting from the regression of the independent variable of current earnings ($X_{i,t}$), and the dependent variable of stock market returns[17], is used to measure the *value relevance*, while the goodness-of-fit measure R^2 of *timeliness* is derived by the reverse regression of current earnings ($X_{i,t}$) being the dependent and stock market returns ($R_{i,t}$) being the independent variable[18]. The degree of *conditional conservatism* is determined by the slope coefficient β_2 based on the commonly used regression according to *Basu* (1997)[19].

3 Prior research for Germany

One of the first studies of earnings quality in Germany is conducted by *Gassen/Sellhorn* (2006). They compare the relative quality of IAS/IFRS and German-GAAP earnings by a sample of 354 German listed companies each, in the period from 1998 to 2004. They show that the persistence of earnings of those companies accounting by IAS/IFRS is significantly higher than of those companies accounting by German-GAAP. Similarly, the quality of accruals appears to be higher in IAS/IFRS accounting than in German-GAAP. There is, however, no statistically significant difference detectable in this measure. *Gassen/Sellhorn* (2006) also find that the predictability of earnings for future earnings is significantly lower in IAS/IFRS reports than in German-GAAP reports. The two market-based measures conditional conservatism and value relevance are again both higher in the earnings reported under IAS/IFRS in comparison to German-GAAP. It should be mentioned, however, that the measure of conditional conservatism of earnings under IAS/IFRS is only slightly significantly higher than of those under German-GAAP and that the results of the measure of value relevance are statistically insignificant. However, the findings of *Gassen/Sellhorn* (2006) regarding the measure of conservatism are confirmed by the more recent studies by *Hung/Subramanyam* (2007) and *Barth et al.* (2008)[20]. The statistically insignificant result *Gassen/Sellhorn* (2006) determine for the measure of value relevance cannot be confirmed, due to the very different findings of *Hung/Subramanyam* (2007), *Jermakowicz et al.* (2007) and *Barth et al.* (2008). Thus *Hung/Subramanyam* (2007) find the value relevance of both accounting systems to be comparable, while *Jermakowicz et al.* (2007) and *Barth et al.* (2008) discover a higher value relevance for earnings according to IAS/IFRS than those according to German-GAAP. Furthermore, *Paananen/Lin* (2009) find a decrease of value relevance for IAS/IFRS over time. *Hung/Subramanyam* (2007) and *Barth et al.* (2008) in addition also examine the earnings according to IAS/IFRS and German-GAAP for indicators of potential earnings management. These studies, however, measure earnings management of the earnings indirectly with the measure of volatility, which results in a significantly higher measure of volatility for earnings according to IAS/IFRS than those according to German-GAAP.

The overall results of the studies outlined above suggest an improvement of the earnings quality of Germany between 1997 and 2006. This naive but prevalent assumption is based mainly on the steadily increasing number of companies accounting by IAS/IFRS between 1997 and 2004[21] and the compulsory use of IFRS by German listed companies since 2005, as well as the empirical findings regarding the measures of persistence, quality of accruals, volatility, earnings management and conservatism. These findings testify a higher quality of earnings detailed under IAS/IFRS than of earnings detailed under German-GAAP. The development of the predictability of earnings for future earnings alone suggests a decrease in earnings quality in Germany over time, due to the generally better results of earnings according to German-GAAP than those according to IAS/IFRS. The sometimes contradicting results of the empirical studies regarding value relevance are to be clarified in the course of this present research. Differences could for example be found in the application of the goodness-of-fit measure R^2 in the measurement of value relevance. *Gu* (2007) emphasizes the problems inherent in the use of the goodness-of-fit measure R^2 when comparing different samples and suggests the use of the standard error of regression $\sigma(\varepsilon)$ as an alternative measure of quality.

It is obvious that prior research in Germany as described above hitherto only captures a part of the picture of the earnings development in Germany. The analyses of earnings quality conducted which solely focus on the comparison of the different accounting systems provided by German-GAAP, IFRS and US-GAAP does not allow formulating conclusive propositions with respect to the development of earnings quality over time. Instead, the proposition of a recent improvement of the earnings quality in Germany needs an examination which captures the development of earnings quality at large. For that purpose the commonly used earnings attributes measures according to *Francis et al.* (2004) are calculated using a sample of 688 German listed companies over a period of ten years (1997 to 2006). The rest of the paper describes the sample, results and conclusions evolving from this examination.

4 Data analysis and results

4.1. Sample description

The following analysis is based on all German listed companies in the Thomson Financial Datastream and Worldscope data bases over a period of ten years from 1997 to 2006. The Worldscope data base holds a total of 899 German listed companies. Since for some of the measures examined in this research it is necessary to use information of the previous or the following period, data of the years 1996 and 2007 is also included. In accordance with other empirical research in this area, all companies with the SIC codes 6000 up to 6799 (i.e. banks, insurance companies and financial firms) are eliminated from the sample. This is due to the fact that the balance sheet structures of these firms are fundamentally different to those of non-financial firms and would not allow for comparison. Furthermore, all those firm years are eliminated, for which Worldscope does not provide data about net income and/or total assets. The final sample thus contains 688 companies and 5,817 firm years. Due to entries and exits of firms during the sample period, the number of observable firms fluctuates between the

years. *Table I* contains an overview of the distribution of the samples for each year from 1997 to 2006.

To get as unbiased results as possible, all data sets for which the necessary data is available are used for the respective analyses. A balanced panel would only contain 375 companies (3,750 firm years) since many firms would have to be eliminated due to poor data quality. Therefore there is the severe potential danger of sample selection bias. Accordingly, the number of firm years varies in the different analyses.

Table I about here

The visual examination of the data by a Box-Whisker-Plot („*eyeball statistics*“) shows that individual statistical series are strongly biased by several outliers in some cases. Instead of simply eliminating the data containing outliers[22], however, the sample is adjusted the following way: to reduce the bias created by outliers, the data is winsorized at the 1- and 99-percentile[23]. It should be noted that, apart from the adjustments outlined above, the data provided by the Worldscope data base are used for the analyses without further verification or corrections of mistakes. Adjustments made by Worldscope are not controlled for. *Table II* offers descriptive statistics for the most important data collected. To avoid possible scale effects, the earnings contained in the regression models are scaled by the total assets at the beginning of a respective period for the determination of accounting-based measures, and by market capitalization at the beginning of a respective period for the determination of market-based measures.

Table II about here

4.2. Research design and the results for each earnings quality measure

In order to examine the development of earnings quality in Germany the commonly used earnings attributes measures as described above are calculated. On principle, the data of the final sample is used for the conduction of cross section analyses for each year separately. Further, pooled cross section-time series analyses are conducted for the total period from 1997 to 2006 and for the two sample periods of 1997 to 2001 and 2002 to 2006. The three different periods allow for a better identification of the earnings quality development over time. Note that due to the problems inherent in the use of the goodness-of-fit measure R^2 when comparing across samples the standard error of regression $\sigma(\varepsilon)$ according to *Gu* (2007) is used as an alternative measure of earnings quality in the respective models.

The results for each earnings quality measure are presented in the *Tables III* to *XII*. The results for the measures for each year are discussed, in case an anomaly can be observed. In general, the results indicate that earnings quality in Germany between 1997 and 2006 tends to improve over time. Therefore, it can be stated that the recent regulatory changes such as the mandatory application of IAS/IFRS for capital market-oriented companies and the adoption of certain auditing, enforcement and corporate governance policies positively affected financial reporting quality in Germany. However, the measures of earnings management and conditional conservatism show far poorer results regarding earnings quality in the period of 2001 to 2003 than in the overall period. As *Figure I* demonstrates by the depiction of the development of the CDAX performance indexes between 1997 and 2006, these poor results correspond with a period of economic downturn. An identification of the reasons for such a decrease in earnings quality during extreme phases of the business cycle would, however, go beyond the scope of this contribution. Such a study would need further research, introducing control variables or a break down of the sample to allow for a more detailed analysis.

Figure I about here

The results for the persistence and the predictability of current earnings for future earnings are presented in *Table III*. For both of these measures earnings quality has improved during the second period (2002 to 2006) compared to the first period (1997 to 2001). Thus, the persistence of current earnings for future earnings increases from 0.510 to 0.523, which indicates a trend of improved earnings quality over time. The standard error of regression as a measure of predictability of current earnings for future earnings developed from 0.190 to 0.148 between the two periods, which also indicates an improvement over time of the earnings quality of this measure. The analysis of predictability highlights the problems inherent in the application of the goodness-of-fit measure R^2 in a comparison of different samples. In this case the goodness-of-fit measure shows a counter development of earnings quality for the two periods of 1997 to 2001 (adjusted R^2 = 34.5%) and 2002 to 2006 (adjusted R^2 = 26.7%). It appears that due to the different properties of the two samples (i.e. from 1997 to 2001 and from 2002 to 2006) the combination of the two parameters – variance of the independent variable (σ_x^2) and variance of the residuals (σ_ε^2) – for the determination of the goodness-of-fit measure R^2 result in biased findings[24].

Table III about here

The quality of accruals as standard error of regression of a regression model of current operating accruals according to *Dechow/Dichev (2002)* and operating cash flows of the previous, the current and the following period is demonstrated in *Table IV*. The standard error of regression for the period of 1997 to 2001 amounts to 0.11, while the standard error of regression for the period from 2002 to 2006 lies at 0.136. This indicates a fairly stable quality of accruals

over time. An examination of each year's result confirms these findings.

Table IV about here

Table V contains the results for the measure of volatility in form of *Spearman's* rank correlations coefficient between changes in accruals and changes in operating cash flows. If a lower volatility of earnings is viewed as an indicator of income smoothing motivated by earnings management, then the development of this measure points to an improvement of earnings quality over time, for the volatility of earnings increases from –0.683 in the period of 1997 to 2001 up to –0.466 from 2002 to 2006.

Table V about here

The results for the measure of earnings management are presented in *Table VI*. In this study, earnings management is determined as the median of the ratio of the absolute terms of accruals and the absolute terms of operating cash flows. For this measure, a higher value indicates lower earnings quality. The examination of the two sample periods shows only a marginal increase of earnings management from 0.802 (from 1997 to 2001) up to 0.846 (from 2002 to 2006). In contrast, the examination of each year allows for a clear observation of the development of this measure over time. Thus, the measure of earnings management has continually decreased since 2002. Earnings management developed from 1.040 in 2002 (highest value of the total period) to 0.644 in 2006 (lowest value of the total period), indicating a continual improvement of earnings quality over this period of time. The findings regarding earnings management thus correspond with the findings regarding volatility as outlined above. The results of this measure for the years of the economic downturn between 2001 and 2003, however, show significantly poorer results concerning earnings quality. As described above, a thorough examination of possible reasons would need further research, introducing control variables or a break down of the sample to allow for a more detailed analysis.

Table VI about here

Tables VII and *VIII* picture the results for the value relevance and the timeliness of earnings respectively. The standard error of regression for these measures amounts to 0.677 and 0.761, respectively, in the first sample period (1997 to 2001), increasing to 0.838 and 1.094, respectively, in the second sample period. Altogether these results indicate a decreasing earnings quality over time for the measures of value relevance and timeliness. Note that in accordance with the earnings management measure described above the standard error of regression measuring the timeliness of earnings shows far poorer results for the period of economic downturn between 2001 and 2003 than in the overall period examined.

Table VII about here

Table VIII about here

In *Table IX*, the measure of conditional conservatism is illustrated by the slope coefficient β_2 of the commonly used regression according to *Basu* (1997). With a value of 2.237, this slope coefficient is higher in the second sample period (2002 to 2006) than in the first period (1997 to 2001) where it amounts to 1.216. Accordingly the examination of this measure also determines a positive development of earnings quality over time. However, examining the individual years, it again becomes apparent that the standard error of regression is much higher in the period of 2001 to 2003 than in all the other years of the total sample period. Since between 2001 and 2003, the majority of enterprises drew up their accounts according to German-GAAP[25], the increased asymmetry between stock market returns and the scaled earnings might be explained by the relatively higher acquisition of losses under German-GAAP. In contrast to IAS/IFRS, the principles of conservatism and imparity under German-GAAP facilitate, during economic downturns, the creation of hidden reserves which can be liquidated during later periods and thus lead to abnormal results. A final confirmation of this hypothesis, however, necessitates further, separate research.

Table IX about here

4.3. Robustness tests

In *Table X through Table XV* robustness tests are undertaken in order to supplement the main findings. More specifically, all aggregate multivariate analyses described above are replicated for the total period and for the two sample periods featuring novelties in the research methodology through the use of *firm fixed effects* and *robust standard errors*. The statistical approach employed allows for an adjustment of heteroskedasticity between firms as well as firm-specific intercepts (unobserved heterogeneity among firms) in order to produce a more efficient estimate of the common slope[26]. It should be pointed out that the majority of international research on earnings quality over time tends to neglect these aspects[27]. In general, the use of firm fixed effects and robust standard errors confirms the overall trend in the development of earnings quality in Germany.

The results for the persistence and the predictability of current earnings for future earnings using firm fixed effects and robust standard errors are presented in *Table X*. Persistence of current earnings for future earnings is lower when taking into account firm fixed effects and robust standard errors (0.268) than when looking at it without the adjustments

(0.516). However, for the two periods of 1997 to 2001 and 2002 to 2006 the results obtained lack statistical significance. The development of the predictability of earnings for future earnings, however, holds when taking firm fixed effects and robust standard errors into account. The standard error of regression as measure of the predictability of current earnings for future earnings decreases between the two sample periods from 0.168 to 0.128.

Table X about here

In *Table XI*, the results for persistence and predictability of current earnings for future earnings are controlled with regard to the market capitalization of the companies examined. As a result, predictability of current earnings for future earnings seems to be higher for companies with a large market capitalization than for companies with a small market capitalization. In contrast, companies with a small market capitalization show a higher persistence of current earnings for future earnings in comparison to companies with a large market capitalization. Possible explanations of these differences would need a more detailed examination, and thus, represent further research opportunities.

Table XI about here

The consideration of firm fixed effects and robust standard errors with regard to the quality of accruals measure underpins the initial results presented above. As demonstrated in *Table XII*, the standard error of regression rises slightly from 0.083 for the period of 1997 to 2001 to 0.107 for the period of 2002 to 2006.

Table XII about here

Tables XII and *XIII* exhibit the results for the value relevance and the timeliness of earnings using firm fixed effects and robust standard errors respectively. The negative tendency of these earnings quality measures are further confirmed when taking into account firm fixed effects and robust standard errors. In this case, the value relevance of earnings for the years from 2002 to 2006 is higher at a standard error of regression of 0.820 than at a standard error of regression of 0.646 for the years between 1997 and 2001. Equally, the timeliness of earnings increases from 0.649 between 1997 and 2001 to 0.977 between 2002 and 2006.

Table XIII about here

Table XIV about here

In *Table XV*, the adjustment of the conditional conservatism measure for firm fixed effects and robust standard errors confirms the positive trend. The slope coefficient amounts to 0.864 for the period from 1997 to 2001 and 1.948 for the period from 2002 to 2006.

Table XV about here

5 Limitations

The methods and findings of the research introduced in this contribution can be criticized for various reasons. Thus the commonly used measures for the determination of earnings quality show considerable weaknesses. On the one hand, the commonly used measures can hardly differentiate between the various factors influencing earnings, such as, e.g., random fluctuations, real earnings management or the risk of faulty accounting and valuation. These different items are contained in the measures as one conjoint item and can thus only serve to indicate tendencies of earnings quality. On the other hand, cash flows are usually considered proper measures which cannot be influenced by management, while accruals are deemed as disadvantageous for earnings quality. High accruals are even interpreted as a form of earnings management. Such an assumption, however, raises some problems. Thus it is particularly due to accruals that earnings provide better information than cash flows[28]. Since earnings management (negative for earnings quality) and information (positive for earnings quality) are hardly to be differentiated by empirical means, extreme care has to be taken when analyzing empirical results under the assumption of a negative effect of accruals on the earnings quality.

Also, the weaknesses of the individual measures analyzed in this study should be considered. Thus the determination of the measures persistence and earnings management do not take into account that earnings quality is dependent on both the information content of accounting and the company's economic activity[29]. To be able to truly assess the information content of accounting, however, a separation of these two components would be necessary. In addition, the empirical determination of earnings management is particularly hard, since earnings management is the most beneficial for an enterprise as long as it remains undetected. Furthermore, the measure of earnings management as applied here attempts merely to observe earnings management in the accounts. Real earnings management thus remains neglected, which might lead to a biased picture of the measure of earnings management. With regard to the measure of predictability the question arises why predictability should only be based on the temporal development of earnings. After all, the accounting's addressees have ample additional information at their disposal, allowing for alternative evaluations of predictability. The measure of quality of accruals neglects the information content of accruals. Thus a depreciation of, e.g., claims or reserves might be interpreted as "mistake", regardless of the possibility that such a depreciation is based on additional information, which it serves to convey. Also the results for the measure of volatility are difficult to evaluate. There are controversial opinions in accounting literature whether a lower measure of volatility indicates a higher

earnings quality or should be interpreted as a form of earnings management[30]. Value relevance, timeliness and conditional conservatism as measures need to be viewed critically, since the adherent associativity of earnings and market returns lacks theoretical foundation. Thus changes in market returns might be explained by the market making use of alternative information, which might be more reliable and/or more relevant and/or sooner available than the earnings contained in the financial statement[31]. Furthermore, *Penman* (2003) points out the problems of interpreting a low associativity of earnings and market returns as a low earnings quality. Thus a decrease of the value relevance of earnings might be caused by a fundamentally unjustified development of the market – such as a stock market bubble[32].

6 Conclusions

This contribution examines the development of earnings quality in Germany over time. The assessment of the temporal development of earnings quality of German listed companies between 1997 and 2006 is based on the calculation of the commonly used measures according to *Francis et al.* (2004) *persistence*, *predictability*, *quality of accruals*, *volatility*, *earnings management*, *value relevance*, *timeliness* and *conservatism* with the means of panel OLS regressions. In addition, robustness tests take into account firm fixed effects and robust standard errors as novelties in the research methodology.

The main results of this analysis can be summarized as follows. Overall earnings quality has improved in Germany over time between 1997 and 2006. This positive trend is expressed by a higher persistence and predictability of earnings. Higher volatility and lower earnings management as well as higher conditional conservatism confirm this trend.

The measures of value relevance and timeliness show an adverse development of earnings quality over the same period from 1997 to 2006. However, the associativity of earnings and market returns is often criticized, since it remains unclear whether changes in stock market returns could be explained by the market making use of alternative information.

Further research needs identified include a detailed investigation of the reasons for the different earnings quality results of companies with a large market capitalization in comparison to companies with a small market capitalization. In addition, a thorough analysis of the earnings quality development during extreme phases of the business cycle should be conducted.

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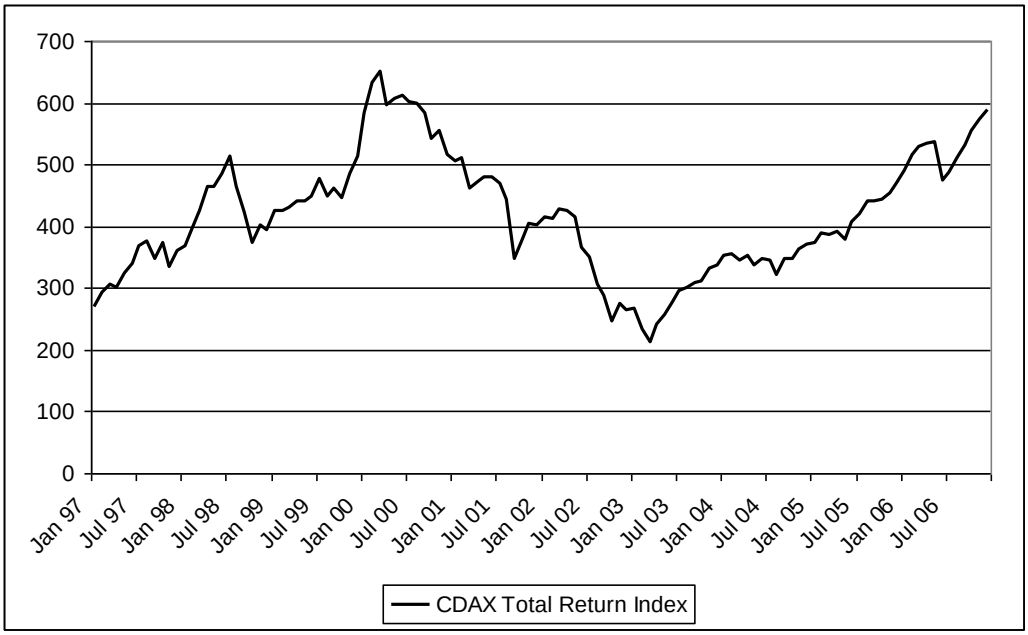
Appendices

Appendix A – Figures for the manuscript "The Development of Earnings Quality in Germany"

Figure I – The development of the CDAX performance indexes from 1997 to 2006



Source: Datastream.

Appendix B – Tables for the manuscript "The Development of Earnings Quality in Germany"

Table I – Distribution of firms over time

Year	*Number of Firms*
1997	554
1998	626
1999	615
2000	657
2001	631
2002	599
2003	576
2004	548
2005	520
2006	491
1997 - 2006	5,817

Table I exhibits the distribution of firms over time. It should be noted that the fluctuation in sample size is due both to data quality and entry and exit of firms.

Table II – Descriptive statistics

	Earnings	*Operating Cash Flows*	*Total Assets*	*Market Capitali-zation*	*Accruals*	*15-Month Stock Market Returns*
arithmetic Mean	45,803	155,828	1,792,356	1,094,086	-103,821	0.17803
Median	1,130	4,726	86,680	65,036	-4,380	0.03792
Standard Error	218,630	690,046	8,464,115	4,183,291	507,013	0.82701
Minimum	-122,570	-61,299	826	947	-5,616,004	-0.95513
Maximum	1,689,115	5,493,434	72,862,185	30,994,107	1,103,299	3.91239
Firm Years	5,817	4,931	5,817	5,251	4,931	4,453

Table II exhibits the descriptive statistics of most important data items (winsorized sample). The data for earnings, operating cash flows, total assets, and market capitalization are directly taken from Worldscope and Datastream databases. Accruals equal the difference between earnings and operating cash flows. The 15-month stock market returns describe returns of the company *i*, which a stock yielded from January, 1st of the sample year to March, 31st of the following year.

Table III – Persistence and predictability of current earnings for future earnings (Regression by panel OLS)

Year	α_0	β_1	*Adj.* R^2	*Standard Error*	*n*
1997	0.017 **	0.375 ***	0.155 ***	0.138	413
1998	-0.016 *	0.558 ***	0.343 ***	0.203	537
1999	-0.034 ***	0.631 ***	0.439 ***	0.239	585
2000	-0.028 ***	0.357 ***	0.367 ***	0.154	574
2001	-0.038 ***	0.503 ***	0.227 ***	0.173	591
2002	-0.007	0.430 ***	0.228 ***	0.149	575
2003	0.011	0.380 ***	0.122 ***	0.162	547
2004	0.006	0.621 ***	0.401 ***	0.133	517
2005	0.011	0.594 ***	0.281 ***	0.153	489
2006	0.007	0.645 ***	0.331 ***	0.135	439
1997-2001	-0.022 ***	0.510 ***	0.345 ***	0.190	2,700
2002-2006	0.008 ***	0.523 ***	0.267 ***	0.148	2,567
1997-2006	-0.007 ***	0.516 ***	0.320 ***	0.172	5,267

Table III exhibits the results for the measures of persistence and predictability of current earnings for future earnings, which are determined by panel OLS regressions for the model

$$X_{i,t+1} = \alpha_0 + \beta_1 \cdot X_{i,t} + \varepsilon_{i,t}$$

with $X_{i,t}$ describing the earnings, standardized with total assets at the beginning of a year, of a firm *i* in the period *t*. $\varepsilon_{i,t}$ defines the error term, which represents residual influences. The regressions are conducted both for each individual year, as well as for three aggregate periods. *Standard error* is the standard error of regression. *n* equals the number of observations. * (**, ***) represents the two-sided statistical significance of the regression coefficient on a level of 10% (5%, 1%) (the asterisks behind the *adjusted* R^2 signify the statistical significance for the model (F-statistic)).

Table IV – Quality of accruals
(Regression by panel OLS)

Year	α_0	β_1	β_2	β_3	Adj. I
1998	0.032 ***	-0.019	-1.034 ***	0.027	0.908
1999	0.030 ***	0.004	-0.926 ***	-0.002	0.904
2000	0.042 ***	0.020	-0.929 ***	0.148 ***	0.995
2001	0.020 ***	0.003	-0.751 ***	0.091 ***	0.758
2002	-0.016 **	0.086 ***	-0.557 ***	0.037	0.541
2003	-0.015 **	0.174 ***	-0.921 ***	0.253 ***	0.827
2004	0.003	0.076 ***	-0.630 ***	0.104 ***	0.525
2005	0.025 ***	0.133 ***	-0.834 ***	0.031 **	0.720
2006	0.052 ***	0.049 **	-0.974 ***	0.038 **	0.960
1998-2001	0.031 ***	0.011 **	-0.924 ***	0.004	0.984
2002-2006	0.008 **	0.097 ***	-0.891 ***	0.050 ***	0.820
1998-2006	0.015 ***	0.024 ***	-0.920 ***	0.018 ***	0.953

Table IV exhibits the results for the measure of quality of accruals, which are determined by panel OLS regressions for the model

$$\Delta WC_{i,t,t-1} = \alpha_0 + \beta_1 \cdot CF_{i,t-1} + \beta_2 \cdot CF_{i,t} + \beta_3 \cdot CF_{i,t+1} + \varepsilon_{i,t}$$

with $\Delta WC_{i,t,t-1}$ defining the change of the current operating accruals between the reported period and the preceding period according to *Dechow/Dichev* (2002). WC_i equals the increase of the working capital – the increase of cash and cash equivalents + the increase of short term debt capital – the increase of short term (interest-bearing) liabilities, with all items standardized to the total assets at the beginning of the year. CF_i describes the reduced free operating cash flows, which are calculated as follows: net income after taxes and before extraordinary depreciation + depreciation – changes in the current operating accruals according to *Dechow/Dichev* (2002). The regressions are conducted both for each individual year, as well as for three aggregate periods. *Standard error* defines the standard error of regression. *n* equals the number of observations. * (**, ***) represents the two-sided statistical significance of the regression coeffi-

Table V – Volatility of earnings

Year	*Correlation*	*n*
1997	-0.829 ***	189
1998	-0.805 ***	321
1999	-0.759 ***	414
2000	-0.574 ***	500
2001	-0.589 ***	553
2002	-0.420 ***	533
2003	-0.356 ***	518
2004	-0.453 ***	493
2005	-0.563 ***	471
2006	-0.599 ***	451
1997 - 2001	-0.683 ***	1,977
2002 - 2006	-0.466 ***	2,466
1997 - 2006	-0.570 ***	4,443

Table V exhibits the results for the measure of volatility of earnings, which were determined as the Spearman rank correlations efficient ρ of changes in accruals $\Delta PA_{i,t,t-1}$ and changes in operating cash flows $\Delta CFO_{i,t,t-1}$ each of the preceding year:

$$\rho(\Delta PA_{i,t,t-1}; \Delta CFO_{i,t,t-1}).$$

Again all items were standardized with the total assets at the beginning of each year. *n* equals the number of observations. * (**, ***) represents the two-sided statistical significance of t-test against zero on level of 10% (5%, 1%).

Table VI – Earnings management

Year	*Ratio*	*n*
1997	0.724	233
1998	0.832	378
1999	0.735	499
2000	0.780	537
2001	0.895	564
2002	1.040	542
2003	0.950	524
2004	0.894	495
2005	0.693	477
2006	0.644	455
1997 - 2001	0.802	2,211
2002 - 2006	0.846	2,493
1997 - 2006	0.826	4,704

Table VI exhibits the results for the measure of earnings management. The measure *Ratio* is the median of the ratio of the absolute value of the accrual PA_t and the operating cash flows CFO_t:

$$|PA_t| / |CFO_t|.$$

The accruals PA_t are calculated as the difference between the earnings X_t and the operating cash flows CFO_t. *n* equals the number of observations.

Table VII – Value relevance of earnings
(Regression by panel OLS)

Year	α_0	β_1	*Adj.* R^2	*Standard Error*	*n*
1997	0.393 ***	0.158	0.002	0.618	225
1998	0.111 ***	0.169	0.006	0.644	246
1999	0.189 ***	0.192 **	0.011 **	0.870	287
2000	-0.089 ***	0.263 ***	0.062 ***	0.617	406
2001	-0.216 ***	0.131 ***	0.084 ***	0.507	482
2002	-0.241 ***	0.084 ***	0.097 ***	0.492	461
2003	0.838 ***	0.093 *	0.006 *	1.057	444
2004	0.360 ***	0.121 **	0.009 **	0.747	425
2005	0.596 ***	0.582 ***	0.056 ***	0.758	403
2006	0.326 ***	0.430 ***	0.078 ***	0.563	381
1997-2001	0.022	0.193 ***	0.046 ***	0.677	1,646
2002-2006	0.377 ***	0.258 ***	0.039 ***	0.838	2,114
1997-2006	0.220 ***	0.153 ***	0.034 ***	0.792	3,760

Table VII exhibits the results for the measure of the value relevance of earnings, which are determined by Panel OLS-Regressions for the model

$$R_{i,t} = \alpha_0 + \beta_1 \cdot X_{i,t} / P_{i,t-1} + \varepsilon_{i,t}$$

$R_{i,t}$ defines the 15-month stock market returns of the company *i*, which a stock yielded from January, 1st of the sample year to March, 31st of the following year. $X_{i,t} / P_{i,t-1}$ represent the earnings scaled by market capitalization at the end of the previous year of the company *i* during the period *t*. $\varepsilon_{i,t}$ defines the error term, which represents residual influences. The regressions are conducted both for each individual year, as well as for three aggregate periods. *Standard error* defines the standard error of regression. *n* equals the number of observations. * (**, ***) represents the two-sided statistical significance of the regression coefficient on a level of 10% (5%, 1%) (the asterisks behind the *adjusted* R^2 signify the statistical significance for the model (F-statistic)).

Table VIII – Timeliness of earnings
(Regression by panel OLS)

Year	α_0	β_1	*Adj.* R^2	*Standard Error*	*n*
1997	-0.036	0.041	0.002	0.314	225
1998	-0.014	0.061 ***	0.006	0.387	246
1999	-0.065 **	0.075 **	0.011 **	0.543	287
2000	-0.075 **	0.245 ***	0.062 ***	0.595	406
2001	-0.140 **	0.656 ***	0.084 ***	1.136	482
2002	-0.319 ***	1.182 ***	0.097 ***	1.847	461
2003	-0.348 ***	0.088 *	0.006 *	1.028	444
2004	-0.126 ***	0.098 **	0.009 **	0.673	425
2005	-0.087 ***	0.100 ***	0.056 ***	0.314	403
2006	-0.105 ***	0.187 ***	0.078 ***	0.371	381
1997-2001	-0.128 ***	0.243 ***	0.046 ***	0.761	1,646
2002-2006	-0.325 ***	0.258 ***	0.039 ***	1.094	2,114
1997-2006	-0.233 ***	0.227 ***	0.034 ***	0.967	3,760

Table VIII exhibits the results for the measure of timeliness, which are determined by panel OLS regressions for the model

$$X_{i,t} / P_{i,t-1} = \alpha_0 + \beta_1 \cdot R_{i,t} + \varepsilon_{i,t}$$

with $X_{i,t} / P_{i,t-1}$ being earnings, scaled by the market capitalization at the end of the previous year, of the company i in the period t. $R_{i,t}$ defines the 15-month stock market returns of the company i, which a stock yielded from January, 1st of the sample year to March, 31st of the following year. $\varepsilon_{i,t}$ defines the error term, which represents residual influences. The regressions are conducted both for each individual year, as well as for three aggregate periods. *Standard error* defines the standard error of regression. *n* equals the number of observations. * (**, ***) represents the two-sided statistical significance of the regression coefficient on a level of 10% (5%, 1%) (the asterisks behind the *adjusted* R^2 signify the statistical significance for the model (F-statistic)).

Table IX – Conditional conservatism
(Regression by panel OLS)

Year	α_0	α_1	β_1	β_2	*Adj.* R^2	*Standard Error*	*n*
1997	-0.019	0.139 *	0.018	1.025 ***	0.036 **	0.308	225
1998	0.064	-0.021	-0.020	0.454 **	0.037 ***	0.381	246
1999	-0.007	0.297 ***	0.013	1.509 ***	0.136 ***	0.508	287
2000	0.031	0.199 **	0.007	0.916 ***	0.152 ***	0.566	406
2001	0.013	0.356 **	0.076	1.523 ***	0.132 ***	1.105	482
2002	0.013	0.684 **	0.020	3.111 ***	0.175 ***	1.765	461
2003	-0.150 **	-0.432 **	-0.020	0.767	0.045 ***	1.008	444
2004	0.035	-0.075	-0.047	0.955 ***	0.061 ***	0.655	425
2005	-0.018	-0.010	0.046 **	1.180 ***	0.154 ***	0.298	403
2006	0.008	0.194 ***	0.029	1.705 ***	0.292 ***	0.325	381
1997-2001	0.017	0.225 ***	0.009	1.216 ***	0.139 ***	0.723	1,646
2002-2006	-0.015	0.274 ***	-0.027	2.237 ***	0.165 ***	1.019	2,114
1997-2006	-0.002	0.229 ***	-0.020	1.662 ***	0.131 ***	0.917	3,760

Table IX exhibits the results for the measure of conditional conservatism, which are determined by panel OLS regressions for the equation of *Basu* (1997)

$$X_{i,t} / P_{i,t-1} = \alpha_0 + \alpha_1 \cdot D_{i,t} + \beta_1 \cdot R_{i,t} + \beta_2 \cdot D_{i,t} \cdot R_{i,t} + \varepsilon_{i,t}$$

with $X_{i,t} / P_{i,t-1}$ defining the earnings, standardized with the total assets at the beginning of a year, of a firm i in the period t. $R_{i,t}$ defines the 15-month stock returns of the company i, which a stock yielded from January, 1st of the sample year to March, 31st of the following year. $D_{i,t}$ is a dummy variable, assuming the values of $D_{i,t} = 0$ for $R_{i,t} \geq 0$ and $D_{i,t} = 1$ for $R_{i,t} < 0$. $\varepsilon_{i,t}$ defines the error term, which represents residual influences. The regressions are conducted both for each individual year, as well as for three aggregate periods. *Standard error* defines the standard error of regression. *n* equals the number of observations. * (**, ***) represents the two-sided statistical significance of the regression coefficient on a level of 10% (5%, 1%) (the asterisks behind the *adjusted* R^2 signify the statistical significance for the model (F-statistic)).

Table X – Persistence and predictability of current earnings for future earnings (Regression by panel OLS, firm fixed effects and robust standard errors)

Year	α_0	β_1	*Adj.* R^2	*Standard Error*	*n*
1997-2001	-0.039 ***	0.015	0.491 ***	0.168	2700
2002-2006	0.003	0.095	0.457 ***	0.128	2567
1997-2006	-0.013 *	0.268 ***	0.404 ***	0.161	5267

Table X exhibits the results for the measures of persistence and predictability of current earnings for future earnings for three aggregate periods using firm fixed effects and robust standard errors, which are determined by panel OLS regressions for the model

$$X_{i,t+1} = \alpha_0 + \beta_1 \cdot X_{i,t} + \varepsilon_{i,t}$$

with $X_{i,t}$ describing the earnings, standardized with total assets at the beginning of a year, of a firm *i* in the period *t*. $\varepsilon_{i,t}$ defines the error term, which represents residual influences. *Standard error* is the standard error of regression. *n* equals the number of observations. * (**, ***) represents the two-sided statistical significance of the regression coefficient on a level of 10% (5%, 1%) (the asterisks behind the *adjusted* R^2 signify the statistical significance for the model (F-statistic)).

Table XI – Persistence and predictability for small versus large caps
Panel A – Regression by panel OLS for firms with a large market capitalization

Year	α_0	β_1	*Adj.* R^2	*Standard Error*	*n*
1997-2006	0.032 ***	0.401 ***	0.386 ***	0.079	576

Panel B – Regression by panel OLS for firms with a small market capitalization

Year	α_0	β_1	*Adj.* R^2	*Standard Error*	*n*
1997-2006	-0.007 ***	0.464 ***	0.270 ***	0.158	4354

Table XI, Panel A exhibits the results for the measures of persistence and predictability of current earnings for future earnings of all firms for which the market capitalization is higher than the overall mean market capitalization, which are determined by panel OLS regressions for the model

$$X_{i,t+1} = \alpha_0 + \beta_1 \cdot X_{i,t} + \varepsilon_{i,t}$$

with $X_{i,t}$ describing the earnings, standardized with total assets at the beginning of a year, of a firm *i* in the period *t*. The regression is conducted for the aggregate period. *Table XI*, *Panel B* exhibits the results of all firms for which the market capitalization is less than or equal to the overall mean market capitalization, which are again determined by panel OLS regressions using the model above. The regression is also conducted for the aggregate period. *Standard error* is the standard error of regression. *n* equals the number of observations. * (**, ***) represents the two-sided statistical significance of the regression coefficient on a level of 10% (5%, 1%) (the asterisks behind the *adjusted* R^2 signify the statistical significance for the model (F-statistic)).

Table XII – Quality of accruals
(Regression by panel OLS using firm fixed effects and robust standard errors)

Year	α_0	β_1	β_2	β_3	Adj. R^2	Standard Error	n
1998-2001	0.033 ***	0.018	-0.913 ***	0.006	0.991 ***	0.083	920
2002-2006	0.004	0.015 ***	-0.926 ***	0.022 *	0.888 ***	0.107	1549
1998-2006	0.013 *	0.005 **	-0.927 ***	0.000	0.972 ***	0.100	2469

Table XII exhibits the results for the measure of quality of accruals for the three aggregate periods using firm fixed effects and robust standard errors, which are determined by panel OLS regressions for the model

$$\Delta WC_{i,t,t-1} = \alpha_0 + \beta_1 \cdot CF_{i,t-1} + \beta_2 \cdot CF_{i,t} + \beta_3 \cdot CF_{i,t+1} + \varepsilon_{i,t}$$

with $\Delta WC_{i,t,t-1}$ defining the change of the current operating accruals between the reported period and the preceding period according to *Dechow/Dichev* (2002). WC_i equals the increase of the working capital – the increase of cash and cash equivalents + the increase of short term debt capital – the increase of short term (interest-bearing) liabilities, with all items standardized to the total assets at the beginning of the year. CF_i describes the reduced free operating cash flows, which are calculated as follows: net income after taxes and before extraordinary depreciation + depreciation – changes in the current operating accruals according to *Dechow/Dichev* (2002). *Standard error* defines the standard error of regression. *n* equals the number of observations. * (**, ***) represents the two-sided statistical significance of the regression coefficient on a level of 10% (5%, 1%) (the asterisks behind the *adjusted* R^2 signify the statistical significance for the model (F-statistic)).

Table XIII – Value relevance of earnings
(Regression by panel OLS using firm fixed effects and robust standard)

Year	α_0	β_1	*Adj.* R^2	*Standard Error*	*n*
1997-2001	0.008	0.082 ***	0.130 ***	0.646	1646
2002-2006	0.393 **	0.219 ***	0.081 ***	0.820	2114
1997-2006	0.222 *	0.166 ***	0.041 ***	0.790	3760

Table XIII exhibits the results for the measure of the value relevance of earnings for three aggregate periods using firm fixed effects and robust standard errors, which are determined by panel OLS regressions for the model

$$R_{i,t} = \alpha_0 + \beta_1 \cdot X_{i,t} / P_{i,t-1} + \varepsilon_{i,t}$$

with $R_{i,t}$ defines the 15-month stock market returns of the company *i*, which a stock yielded from January, 1st of the sample year to March, 31st of the following year. $X_{i,t} / P_{i,t-1}$ represent the earnings scaled by market capitalization at the end of the previous year of the company *i* during the period *t*. $\varepsilon_{i,t}$ defines the error term, which represents residual influences. *Standard error* defines the standard error of regression. *n* equals the number of observations. * (**, ***) represents the two-sided statistical significance of the regression coefficient on a level of 10% (5%, 1%) (the asterisks behind the *adjusted* R^2 signify the statistical significance for the model (F-statistic)).

Table XIV – Timeliness of earnings
(Regression by panel OLS using firm fixed effects and robust standard errors)

Year	α_0	β_1	*Adj.* R^2	*Standard Error*	*n*
1997-2001	-0.128 ***	0.083 ***	0.305 ***	0.649	1646
2002-2006	-0.343 ***	0.311 ***	0.233 ***	0.977	2114
1997-2006	-0.229 ***	0.210 ***	0.186 ***	0.888	3760

Table XIV exhibits the results for the measure of timeliness for three aggregate periods using firm fixed effects and robust standard errors, which are determined by panel OLS regressions for the model

$$X_{i,t} / P_{i,t-1} = \alpha_0 + \beta_1 \cdot R_{i,t} + \varepsilon_{i,t}$$

with $X_{i,t} / P_{i,t-1}$ being earnings, scaled by the market capitalization at the end of the previous year, of the company *i* in the period *t*. $R_{i,t}$ defines the 15-month stock market returns of the company *i*, which a stock yielded from January, 1st of the sample year to March, 31st of the following year. $\varepsilon_{i,t}$ defines the error term, which represents residual influences. *Standard error* defines the standard error of regression. *n* equals the number of observations. * (**, ***) represents the two-sided statistical significance of the regression coefficient on a level of 10% (5%, 1%) (the asterisks behind the *adjusted* R^2 signify the statistical significance for the model (F-statistic)).

Table XV – Conditional conservatism
(Regression by panel OLS, firm fixed effects and robust standard errors)

Year	α_0	α_1	β_1	β_2	*Adj.* R^2	*Standard Error*	*n*
1997-2001	-0.027	0.163 ***	-0.022	0.864 ***	0.328 ***	0.638	1646
2002-2006	-0.099	0.271 **	0.063	1.948 ***	0.304 ***	0.931	2114
1997-2006	-0.063	0.176 **	0.027	1.220 ***	0.224 ***	0.866	3760

Table XV exhibits the results for the measure of conditional conservatism for three aggregate periods using firm fixed effects and robust standard errors, which are determined by panel OLS regressions for the model

$$X_{i,t} / P_{i,t-1} = \alpha_0 + \alpha_1 \cdot D_{i,t} + \beta_1 \cdot R_{i,t} + \beta_2 \cdot D_{i,t} \cdot R_{i,t} + \varepsilon_{i,t}$$

with $X_{i,t} / P_{i,t-1}$ defining the earnings, standardized with the total assets at the beginning of a year, of a firm *i* in the period *t*. $R_{i,t}$ defines the 15-month stock returns of the company *i*, which a stock yielded from January, 1st of the sample year to March, 31st of the following year. $D_{i,t}$ is a dummy variable, assuming the values of $D_{i,t} = 0$ for $R_{i,t} \geq 0$ and $D_{i,t} = 1$ for $R_{i,t} < 0$. $\varepsilon_{i,t}$ defines the error term, which represents residual influences. *Standard error* defines the standard error of regression. *n* equals the number of observations. * (**, ***) represents the two-sided statistical significance of the regression coefficient on a level of 10% (5%, 1%) (the asterisks behind the *adjusted* R^2 signify the statistical significance for the model (F-statistic)).