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ORIGINAL ARTICLE



Changes in the Perception of Error Announcements from the German Two-Tier Enforcement

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Abstract When the German financial reporting enforcement was introduced in 2004, the legislator chose an innovative approach: He combined a private enforcement institution with a governmental agency while sanctioning was carried out solely by publicly announcing identified accounting errors. Subsequently, investors were confronted with up to then unprecedented 'error announcements' from the enforcement system. For a sample of 213 announcements from 2006 to 2019, the paper analyzes the adaptation process of investors to this new information. While significant negative market reactions around the announcement dates can be found for the whole observation period, the results also show that the investors' views of the error announcements change over time. Especially in the early years, the observed market reactions are strongly linked to the impact of the accounting error on the firm's financial situation. This link weakens over time and factors related to the nature of the error become more important to investors. In particular, errors that are attributable to the unjustifiable application of professional judgment lead to significantly more negative effects.

Keywords Accounting errors · Adaptation · Enforcement · FREP · Event study · Exercise of discretion · Corporate governance

JEL Classification $G18 \cdot G41 \cdot M41 \cdot M42 \cdot M48$

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1 Introduction

About 20 years ago, the German legislator took a unique decision: In the aftermath of several accounting failures in the early 2000 years (e.g. Flowtex and Comroad in Germany, Enron and Worldcom in the U.S.), a complete reorganization of the German accounting enforcement system was decided. The crucial point was to strengthen the enforcement system with a third enforcement body (in addition to the Supervisory Board and the auditor). This fact in itself is not very newsworthy since several other jurisdictions already had external accounting enforcement institutions in place at the time. What was unique is the approach of combining a private enforcement body with a governmental agency to a two-stage enforcement structure. The basic idea is to initially give preparers a chance to participate in the interpretation and enforcement of accounting standards "at eye level", and only if this process fails, then a governmental authority intervenes. Consequently, this system in general, which initially relies on voluntary participation, does not involve any further sanctions-except for a capital market reaction. In practice, the only sanction is the public announcement of an identified accounting error (the so called "naming and shaming").

Not only was this approach almost unique in the world at that time, but also from a scientific perspective it enabled new possibilities for the isolated investigation of the effects of accounting errors—separated from further effects such as financial penalties or possible claims for compensatory damages. Consequently, only a few years later, the much recognized and frequently cited study of Hitz et al. (2012) was published, which for the first time made use of this setting for their analysis. Their results that error announcements are new, negative, and persistent information have been widely received.

Nevertheless, much has changed since then. The (financial) world has not only experienced a financial crisis that has changed and sensitized the view of many investors, especially about aspects of corporate governance and the true and fair view; but the (enforcement) institutions have also changed and adapted to this new environment. Recently, the Wirecard scandal has once again led to far-reaching changes in the enforcement environment. The entire structure and effectiveness of the enforcement system thus came back into the focus of the legislator (Berninger et al. 2023b). In turn, investors are therefore confronted with continuous changes in this area: While in the first years, the enforcement system was new and unknown, with each additional year investors gained more experience in the interpretation of error announcements. After such largely institutional changes, investors need some time (or more precisely: "data points") to adjust and accurately interpret this new information. For example, related learning effects can also be observed in the initial interpretation of IAS statements after they were first used voluntarily at the turn of the millennium (Cuijpers and Buijink 2005; Brüggemann et al. 2013), as well as in the overall development of accounting practices (Hombach and Sellhorn 2022). To study these adaptation processes during the implementation of the German enforcement mechanism, the present study builds on the fundamental work of Hitz et al. (2012) and extends their research in terms of time and scope: Firstly, it uses the significantly longer period of time now available to examine the stability of the

previous results over time. Based on the previous reasoning that investors first might have to familiarize themselves with the new enforcement framework, it incrementally examines a possible change in the investors' views on error announcements over time. The study thus also ties in with seminal studies on capital market reactions to published accounting errors and their determinants (e.g. Karpoff et al. 2008; Palmrose et al. 2004) which so far have mainly been focused on the US stock market. Utilizing an event study methodology, the study analyzes capital market responses to error announcements by assessing abnormal stock returns, variations in relative trading volume, and shifts in the bid-ask spread. Regression analyses are performed to identify factors having explanatory power for the observed capital market reactions. Here, it also aims to incorporate factors that provide the capital market with information on the underlying cause of the errors (Plumlee and Yohn 2010). Furthermore, three distinct periods¹ during the genesis of the enforcement mechanism are examined to determine any changes occurring within the observation period. The three phases examined here thus cover the entire development of "legacy" enforcement in Germany. In perspective, a fourth phase of the "new" regime now follows. The study therefore also builds on Meser et al. (2015), who examine the effects of changing disclosure and enforcement regulations in a dynamic environment.

The results are manifold: First, error announcements still lead to significant capital market reactions. Around the publication date, an abnormal share price reaction of -0.8% is observed. In addition, a significant widening of the bid-ask spread and a significant reduction in trading volume can be identified during this period. These reactions are relatively stable over time; within the sub-periods analyzed negative market reactions can also be consistently observed. Nevertheless, the investors' perception of the error announcements changes over time. While especially in the early years the magnitude of the observed market reactions was strongly linked to the direct impact of the detected accounting error on the firm's financial situation, this link weakens over time. Increasingly, factors that are related to the nature of the error become more important to the investors. In particular, errors that are attributable to the unjustifiable application of professional judgment lead to significantly more negative effects in recent years.

These findings underscore the continued relevance of error announcements from the German enforcement framework to investors. From a regulatory perspective, this ongoing significance informs the debate about the efficacy and controversy of the naming and shaming approach almost two decades after its introduction (Berninger et al. 2023b). The evolution in investors' perception on the other hand might result from an adaption process (Lo 2004), as market participants become attuned to the system's inherent strengths and limitations. In this regard, it is noteworthy to recapitulate that the enforcement framework had no direct predecessor when it was first introduced. Therefore, not all investors may have been fully aware of the particular focus of the system (mainly clarifying disputed accounting issues "on an equal footing" and not detection of criminal accounting fraud). This study not only extends the time frame of Hitz et al. (2012) but also enriches the literature

¹ A "learning phase" (2006–2008), the period of the financial crisis (2009–2012), and a period when the system is widely established within the capital market (2013–2019).

by demonstrating how the behavior of investors evolves in response to sustained regulatory mechanisms and systemic changes. By isolating the effects of regulatory announcements from other sanctions, this research provides additional insights into the informational impact of accounting enforcement actions.

2 Background On the German Accounting Enforcement

2.1 Regulatory Framework

The German enforcement system has undergone a number of far-reaching changes in the aftermath of the Wirecard scandal (Atzler et al. 2020). In this respect, the main elements of the regulatory environment in force during the sample period (2006–2019) are briefly summarized below. For further details, see for example the description in Hitz et al. (2012).

The German (external) two-tier enforcement system was established in the early 2000s during a period of increasing internationalization of capital markets (Haller 2002) and accounting scandals (Peemöller and Hofmann 2005), which highlighted problematic relationships between companies and external auditors (Eilifsen and Quick 2004). At the same time, the listed companies were also required² to prepare consolidated financial statements under International Financial Reporting Standards (IFRS) (Capkun et al. 2016; Chen et al. 2010; Christensen et al. 2015; Ernstberger et al. 2012; Haller et al. 2009). Germany adopted a unique hybrid two-tier approach combining a private-law association FREP (Deutsche Prüfstelle für Rechnungslegung e. V. = Financial Reporting Enforcement Panel) and a governmental authority BaFin (Bundesanstalt für Finanzdienstleistungsaufsicht = Federal Financial Supervisory Authority), allowing self-regulation at the primary level and state intervention only if necessary (Wahlers 2011; Eisenschmidt and Scheel 2015). Its only sanction mechanism is the public disclosure ("naming and shaming") of errors, letting the market independently interpret and adjust the company's stock price. This framework is ideal for empirical analyses, isolating the effects of identified accounting errors (Isidro et al. 2020). Other countries, like Austria, have adopted similar systems (Pucher 2014), highlighting the influence of the German approach. As part of the recent new regulations,³ the FREP at the first stage has been eliminated, all examinations are now carried out uniformly by BaFin. However, the public announcement has been kept unchanged as the sole sanctioning instrument. Furthermore, BaFin is now granted the right to inform the public about ongoing enforcement proceedings in advance. With this background, the findings remain of considerable current relevance.

² Due to Regulation (EC) No 1606/2002 of the European Parliament and of the Council of 19 July 2002 on the application of international accounting standards; hereinafter: 'IAS Regulation'.

³ For a more detailed presentation of the new legal regulations, see e.g. Peters-Olbrich (2022); Kliem et al. (2021); Markworth and Bangen (2021).

	Ongoing review	Concluded review
Material error findings	Voluntary disclosure by the company (Additional variable 'Pre-notifica- tion')	Mandatory disclosure by the company (Primary variable for the subsequent analysis)
No material errors identified	Voluntary disclosure by the company	Voluntary disclosure by the company

 Table 1
 Overview of possible outcomes of an enforcement procedure and relevant data considered in the analysis. (Own adaptation, based on Hitz and Schnack 2019)

2.2 Process of an Enforcement Examination

Up to 2022, all examinations began on level of the FREP, BaFin stepping in (under public law) only if necessary, e.g. if the firm refuses to cooperate or disagrees with FREP's ruling. FREP acted on concrete indications of accounting violations or upon BaFin's request (Anlassprüfung "cause-related audit"), and also conducted annual sample-based audits (Stichprobenprüfung "sample-based audit"). These elements will in general also be retained at BaFin level in the future—only the first stage of the examination by FREP is omitted since 2022. All firms listed on a regulated German stock market can be examined. The selection for audits follows a threestage process, ensuring regular and timely audits of high-risk cases. Examinations averaged 1–2 years, with a mean of 1.9 years between the financial statement reporting date and error announcement publication (1.7 years for FREP alone, 2.5 years with BaFin's involvement). No official information was provided during ongoing proceedings, although some companies voluntarily disclosed this (Hitz and Schnack 2019). Examinations cover the most recent financial statements and reports. Procedures conclude with either a non-public notification of no material errors, sometimes with recommendations (Berninger 2020, p. 384f.), or notification of errors requiring public disclosure. A summary of these possible disclosures on ongoing and completed enforcement proceedings is provided in Table 1.

Some companies avoided error disclosure by delisting from the stock exchange or leaving the regulated market shortly after (Bessler et al. 2022; Hitz et al. 2020; Berninger 2020). According to German legislation, errors must be published "without undue delay," typically within 2 weeks, depending on the case. Companies are usually given the chance to comment on errors before BaFin issues a publication



Fig. 1 Timeline of an enforcement procedure (until 2022, former two-tier system)

order, which can influence the actual publication date and allow for some timing flexibility (Berninger and Hausmann 2021). Figure 1 summarizes these key steps of the enforcement procedure based on the former two-stage approach.

3 Literature Review

3.1 Stock Market Reactions On the Disclosure of Accounting Errors

Since the public announcement of accounting errors is the only sanction in the enforcement system, understanding investors' reactions and subsequent market effects is crucial. Nevertheless, previous research on the capital market reactions to published accounting errors is mainly focused on the U.S. stock market, showing highly negative abnormal returns around -10% around the time of the announcement (e.g. Feroz et al. 1991; Dechow et al. 1996; Palmrose et al. 2004; Callen et al. 2006; Karpoff et al. 2008; Bardos et al. 2013), which is usually attributed to the high litigation risks in the US (La Porta et al. 2006). This contrasts with Germany's negligible litigation risks and absence of fines, therefore making Germany ideal for empirically isolating pure effects of accounting standard breaches (Isidro et al. 2020). A first such study in the context of the German enforcement system was conducted by Hitz et al. (2012) for 45 disclosures of errors from the years 2005–2009, finding significant negative abnormal returns of -1.15% on average for a three-day window around the publication. Hecker and Wild (2012) found similar results of -1.30% for 70 published errors. Long-term analyses show worse stock performance for German companies with error disclosures compared to peers (Hitz et al. 2020), alongside weaker operating performance with lower cash flows and profitability (Strohmenger 2014). In the US, long-term impacts of error announcements include decreased average daily returns by 19 basis points, reduced liquidity, increased bid-ask spreads, and higher stock price volatility (Morris et al. 2019). Companies investigated for fraud generally underperform peers in cash flow and returns (Leng et al. 2011).

3.2 Factors Influencing the Stock Market Reaction and Further Indirect Effects

In turn, at least two effects are central determinants to the observable share price losses: First, announcements of accounting errors often deal with a deterioration in the company's earnings situation in one or more periods. Thus, the expected future cash inflows for the investors change negatively, leading to a negative adjustment in its net present value. Furthermore, an increased uncertainty (Hribar and Jenkins 2004) and a loss of reputation (Murphy et al. 2009) also have an increasing effect on the company's cost of equity (Firth et al. 2011) and therefore lead to a higher discount rate. Several other studies examined the factors influencing the observed capital market reactions. It is documented that the capital market reactions are significantly influenced by the existence of a fraudulent motive, the severity of the accounting error and its influence on the proceeds (Palmrose et al. 2004). Furthermore, the way in which the accounting error itself is presented in the company's communication

also plays a role in the capital market's *perception* of the accounting error (Files et al. 2009; Gordon and Henry 2013).

Beyond these direct stock price effects, there are several more negative consequences of revealed accounting errors documented in the literature: With regard to the information provided by analysts, it has been observed that accounting misstatements reduce the accuracy (Preiato et al. 2015) and contemporaneous increases the dispersion of analysts' forecasts (Palmrose et al. 2004). Furthermore, there are also retroactive effects of identified accounting errors on the management documented. E.g. Srinivasan (2005) shows that subsequently the fluctuation in top management significantly increases. This effect is driven by the severity of the error on the one hand and its impact on revenues on the other. In addition, it can be seen that these companies hire less personal in the years after an accounting error has been identified, which could be the result of a worsening economic situation and a loss of reputation (Desai et al. 2006).

4 Data Selection and Methodology

The following section first describes the collection and processing procedures of the sample of published accounting errors. Subsequently, the methods used to analyze their impact on the stock prices are described. The procedure is oriented on the approach of Hitz et al. (2012), also in order to foster a comparability with these results for the longer time span and a four times larger data sample. Since this study is primarily focused on the content of the identified accounting errors, the framework of Hitz et al. (2012) is adjusted and extended in several ways (as described below). Nevertheless, it is made sure that in the first steps of the analysis the previous findings can still be used as comparative figures. With regard to the still very limited number of non-US studies on the enforcement of accounting standards, a comparability of the results is beneficial.

4.1 Sample Selection Procedure

Primary data source of the study are the public announcements of accounting errors as published in the German Electronic Federal Gazette (*Bundesanzeiger*) between 2006 and 2019 as part of enforcement measures by FREP and BaFin. Parts of the dataset and analyzes are based on a chapter of the author's dissertation (Berninger 2020). The related financial statements comprise of the fiscal years between 2004 and 2018. In total, 280 error announcements were published in the Federal Gazette for this period. The years 2020 and 2021 were not included because (a) they were both strongly affected by the global Covid-19 pandemic, which led to unprecedented volatility in the international financial markets (Baek et al. 2020; Contessi and De Pace 2021) and (b) beginning in mid-2020, the regulatory redesign process of the German enforcement system was in development, whereby it initially remained unclear whether the FREP would be kept as the first stage of enforcement (Busch 2022; Berninger et al. 2023b). This uncertainty might have subsequently affected the confidence in the examination results that came from the FREP.

Table 2 Summary of the sample selection procedure	Number of Obs			
	Error announcements 01/2006–12/2019	280	-	
	Correction messages	-	-14	
	Multiple statements	-	-11	
	Bond issuers	-	-14	
	Foreign issuers	-	-15	
	Confounding events	-	-9	
	Missing data	-	-4	
	Sample for event study	213	-	
	Banks and insurance companies	-	-13	
	Sample for regression analyses ^a	200	-	

^a For some observations however not all (control) variables could be collected. The number of observations is therefore reduced in the corresponding models (see below)

The initial sample of 280 error announcements had to be cleaned, e.g. by correction messages for a previous error announcement, simultaneously published announcements about errors in different financial statements of the same company, pure debt issuers, confounding events of other value relevant information published during the event windows and missing data. This cleaning procedure, as detailed outlined in Table 2, leaves a total of 213 observations for the event study analysis. Since the additional regression analyses use financial figures with limited relevance for banks and insurance companies, this step excludes another 13 error announcements from these sectors.

The capital market and financial data are primarily sourced from Refinitiv, error announcements, and the companies' financial statements. Due to limited data availability, especially for early error announcements, the sample size is reduced, particularly for changes in the bid-ask spread and trading volume. Reduced sample sizes are noted in each case. Some financial indicators were, as far as possible, supplemented manually from financial statements when not available in databases. Consequently, sample sizes in regression models may vary, with reductions explicitly noted.

4.2 Breakdown into Year Clusters

This initial sample of 213 observations is then divided into three individual year clusters. This step is based on the assumption that, similar to the introduction of IAS/ IFRS itself (Cuijpers and Buijink 2005; Brüggemann et al. 2013), the implementation of the enforcement regime may also be characterized by adaptation or even dulling processes, which could lead to changes in market responses over time. By dividing the sample into several clusters, the market reactions to the error announcements and thus any changes over time can be examined in order to draw conclusions about a possible change in interpretation and the underlying adaptation process. The breakdown is made into the following three year clusters:

- 2006–2008: Implementation of the enforcement, "learning phase" (55 observations)
- 2009–2012: Financial crisis, first "acid test" (86 observations)
- 2013–2019: System is widely established (72 observations)

The clusters thus comprise three very different phases, from which it can be assumed that the error announcements may have been perceived in different forms by the investors. Furthermore, this classification ensures that the number of observations in the individual clusters is relatively balanced.

4.3 Event Study Methodology

To assess the informational effect of error announcements, the study follows established methodology (e.g. Berninger et al. 2023a; Hitz et al. 2012) and computes (cumulative) abnormal returns, (cumulative) abnormal trading volumes, and (average) abnormal bid-ask spreads. The methods generally rely on the efficient market hypothesis as described by Fama (1970). Cumulative abnormal returns are derived by three different methods to ensure robustness with regard to some relatively small companies in the sample with a comparatively low liquidity.⁴ In all models, the CDAX index, containing all securities listed on the regulated market of the Frankfurt Stock Exchange, serves as proxy for the market portfolio. In the market model, a 250 trading-day estimation period (equaling roughly one calendar year) prior to the event is applied. For all three models, abnormal returns for different estimation windows of up to 5 days around the announcement day are calculated. When deriving *abnormal relative trading volumes*, the approaches of Bamber and Cheon (1995) and Cready and Hurtt (2002) will be followed, while the estimated (expected) trading volumes are calculated as the average of the daily trading volumes in the period of 150 days prior to the error announcement. Finally, to determine changes in bid-ask spreads around the announcements, the approach of Bushee et al. (2010) is applied.

4.4 Control Variables

The variables included in the regression analyses are partly based on Hitz et al. (2012) for comparability and due to proven significance. This set is enhanced primarily by variables that further characterize the identified error. The analyzed control variables can be subdivided into three areas (1) *Error characteristics*, (2) *Enforcement procedure characteristics*, and (3) *Company characteristics*. Detailed explanations of the individual control variables and their measurement are provided in the appendix. The first group *Error characteristics* includes variables that reflect characteristics of the identified errors. *Severity* captures the error's effect on the firm's

⁴ The "standard" *market model* is therefore supplemented by the market-adjusted model and the meanadjusted model. The latter methods are less sensitive to the liquidity of the share compared to the market model. For a comprehensive comparison between market model and mean value adjustment, see Brown and Warner (1980).

equity and debt position, *Individual statement* reflects the type of the erroneous financial statement, Profit proxies if earnings were misstated, Notes indicates errors that only relate to missing or incomplete disclosures in the notes to the financial statement and Judgement focuses on errors for which the relevant accounting standard allows considerable discretion. The variables in the second group Enforcement procedure characteristics proxy for properties of the enforcement procedure itself. BaFin indicates whether the examination was transferred to the BaFin on the second stage, Delay counts the days between filing of the erroneous statement and publication of the error announcement, and Pre-notification indicates whether the examination was disclosed before the final error announcement. The last group of variables, Company characteristics, reflect the financial situation and governance structure of the company. Accounting policy includes discretionary accruals to capture earnings management related to error disclosures, Change includes whether between filing of the statements and the error announcement a change in top management or auditor has taken place, Growth controls for the growth in sales in the five-year period prior to the announcement, ListingDuration counts the number of years a company has been listed at the time of the error announcement, MarketCap represents the logarithmic market capitalization of the company, Leverage includes the capital structure of the company (debt-to-equity ratio), and Free float proxies for controlling owners and large investors.

5 Stock Market Reactions On Published Error Announcements

The following section presents the first part of the empirical results of the study. Initially, the short-term capital market reactions (based on changes in stock returns, trading volumes and bid-ask spreads) to error disclosures are presented; as a start, this is done without any further consideration of the other influencing factors discussed above. These factors are then additionally included in Sect. 5.4 by several multivariate regression analyses. In each step, the analyses are initially performed for the pooled sample (entire observation period) and then individually for three year clusters as described in Sect. 4.2.

				CAAR			
Event	п	Market mod	lel	Adj. market	model	Market adj.	model
window		Mean	Median	Mean	Median	Mean	Median
[-2; 2]	213	0.476	-0.043	0.313	-0.138	0.525	0.011
[-1; 1]	213	-0.810**	-0.129**	-0.801**	-0.230**	-0.748*	-0.187**
[0]	213	-0.419	-0.040**	-0.393	-0.257*	-0.388	-0.299*
[0; 1]	213	-0.416	-0.168**	-0.359	-0.110	-0.348	-0.263

Table 3 Stock price reactions to the publication of error announcements

All reported (cumulative) abnormal returns in percent

*/**/*** indicate significance levels of 10%, 5%, 1% of a two-sided t-test or a Wilcoxon signed-rank test

5.1 Effects On Stock Returns

The results of the (stock price) event studies for the full observation period (2006–2019) under the different methodologies are presented in Table 3. The reactions of the share prices reflect the direct value relevance of the error announcements.

In general, it can be seen that all three applied models tend to show comparable results. This indicates the robustness of the results, despite the limited sample size and the partly rather low liquidity of the examined stocks. All models show significant abnormal price reactions in the symmetric three-day window [-1; 1] around the error announcements. On average, these are about -0.8%. Also at the day of the event [0] itself as well as with additional inclusion of the following day (event window [0; 1]) negative price reactions can be observed in all models. There are also indications that the changes in price partially start on the day before the actual announcement; this may be due to rumors that have already arisen or to an announcement by the company itself that was made independently of the publication in the electronic Federal Gazette.

It can therefore be confirmed that the capital market is aware of the notifications of accounting errors published by the German enforcement system. These announcements are also considered as highly value relevant. The observed abnormal returns are of a comparable order of magnitude as in previous studies (Hitz et al. 2012; Hecker and Wild 2012). Since these studies cover significantly shorter observation periods, the present findings can be interpreted to draw conclusions about the stability of capital market reactions over the previous years.

It is already noticeable at this point that there is still a strong discrepancy between the capital market reactions in Germany and in the U.S. In the U.S. abnormal price drops of up to -13% can be observed on the announcement day. As already mentioned, this can in particular be related to the much higher litigation risks in the U.S. with regard to incorrect financial statements (La Porta et al. 2006). In Table 4, the stock price reactions are broken down by the most frequent error categories.⁵

Overall, a strong heterogeneity of capital market reactions is evident here. The reactions between the categories are very different, and even within these categories

		CAAR [-1; 1]
Type of error	Ν	Mean	Median
Notes	89	0.214	-0.144
Report/Information	98	-0.686	-0.174
Financial Instruments	18	1.781	0.077
Cash Flow Statement/P&L	41	0.811	0.012
Deferred taxes	35	-1.291	-1.540
Acquisitions	30	-0.510	-0.403

 Table 4
 Stock price reactions by error categories

All cumulative abnormal returns (determined by the market model) are in percent Individual error announcements often contain errors of multiple categories

⁵ The categorization is based on that used by the FREP in its Annual Activity Reports (see https://www. frep.info/presse/taetigkeitsberichte_en.php).

			CAAR			
Event window	2006–2008 (<i>n</i> =55)		2009–2012 (<i>n</i> =86)		2013–2019 (<i>n</i> =72)	
	Mean	Median	Mean	Median	Mean	Median
[-2; 2]	0.225	-0.253	1.051	-0.051	-0.025	-0.019
[-1; 1]	-0.767	-0.304	-0.608	-0.493	-1.086*	-0.040*
[0]	-0.714	-0.225**	-0.119	-0.155	-0.551	-0.056***
[0; 1]	-0.299	-0.422	-0.652	-0.288	-0.222	-0.024

 Table 5
 Stock price reactions to the publication of error announcements for different year clusters

All reported (cumulative) abnormal returns in percent, determined by the market model

*/**/*** indicate significance levels of 10%, 5%, 1% of a two-sided t-test or a Wilcoxon signed-rank test

there is often a clear difference between the mean and median, which indicates a strong variability. There are several possible reasons for the fact that positive (albeit insignificant) reactions also occur in terms of amount: It is possible that the stock market anticipates further announcements of errors from previous ones as a result of an industry-specific accumulation around certain accounting problems (Gleason et al. 2008) or that this leads to a lower market perception of some announcements. Furthermore, in the case of profit-related errors, it is also conceivable that other identified errors counteract these and therefore weaken the capital market reaction (Palmrose et al. 2004; Xu et al. 2006).

In the following, the effects of an error announcement on the stock price in the individual clusters are examined. The event studies under the market model methodology are used for this purpose⁶ with the same event windows as above. The results are presented in Table 5.

Overall, the previous results can generally be confirmed also within the individual year clusters. All sub-periods consistently show negative abnormal capital market reactions by both mean and median. A clear tendency, e.g. towards a weakening of the reactions over time due to possible dulling effects, cannot be observed either. Thus, even 15 years after the introduction of the two-tier enforcement system in Germany, the publication of error announcements has not lost any of its fundamental importance for investors. This is not necessarily to be expected, as there is certainly a substitutive relationship between high levels of enforcement and disclosure regulations in the literature (Meser et al. 2015). In this respect, a general increase in disclosure obligations during this period could well have been accompanied by a loss in the importance of disclosures in the context of the enforcement procedures.

5.2 Effects On Trading Volume

In the next step, it is analyzed whether an error disclosure affects not only the share price but also the trading volume of the shares. Due to limited data availability, the (abnormal) trading volume could only be determined for 103 observations. Since

⁶ The other methodologies previously applied in Table 3 were also tested and lead in general comparable results. They are not presented explicitly for the sake of brevity but are available from the author upon request.

Table 6 Changes in the relative trading volume when error announcements are published			ATV	
	Event window	Ν	Mean	Median
	[-2; 2]	69	0.045	-0.002
	[-1; 1]	82	0.055	-0.031*
	[0]	103	0.030	-0.023***
	[0; 1]	93	0.044	-0.054***

All (cumulative) relative abnormal trading volumes in percent

*/**/*** indicate significance levels of 10%, 5%, 1% of a two-sided t-test or a Wilcoxon signed-rank test

some shares were not traded on all days of the event windows, the number of observations is further reduced in some cases. A restriction to the 69 complete observations for the purpose of a robustness analysis⁷ yields similar results to those presented in Table 6.

On average, the relative trading volumes increase slightly on the day the error announcement is published and on the subsequent day. This is in contrast to Hitz et al. (2012) who report on average reduced daily trading volumes. However, since the observed increases do not occur on a statistically significant level and considering a normal distribution assumption might be regarded as critical in the given sample, preference in the interpretation could be given to the non-parametric test. Here, a significantly negative abnormal relative trading volume is shown, although it is only slightly pronounced at about -0.02%. This is in principle in line with the findings of Hitz et al. (2012). An uncertainty in the market behavior of the investors is therefore reflected by the publication of error announcements. Investors initially need some time to assess the actual impact of the identified accounting errors on the expected future cash flows of the company and react with caution in buying and selling transactions.

			ATV			
Event window	2006-2008 $(n=20)^{a}$		2009-2012 $(n=38)^{a}$		2013-2019 $(n=45)^{a}$	
	Mean	Median	Mean	Median	Mean	Median
[-2; 2]	0.227	-0.010	-0.072*	-0.010*	0.056	-0.001
[-1; 1]	0.114	-0.017	-0.054*	-0.017*	0.115	-0.004
[0]	0.071	-0.009*	-0.003	-0.009**	0.041	-0.003
[0; 1]	0.073	-0.025**	-0.022	-0.008*	0.085	-0.004

 Table 7
 Changes in the relative trading volume when error announcements are published for different year clusters

All reported (cumulative) relative abnormal trading volumes in percent

*/**/*** indicate significance levels of 10%, 5%, 1% of a two-sided t-test or a Wilcoxon signed-rank test^a The reported sample size applies to the main event window [0], for the remaining event windows, the numbers of observations are slightly smaller (c.f. pooled sample)

⁷ Not explicitly presented for reasons of clarity.

		ABAS	
Event window	п	Mean	Median
[-2; 2]	204	0.219	0.021**
[-1;1]	204	0.180	0.042*
[0]	204	0.248	0.035
[0; 1]	204	0.301	0.071

Table 8Changes in the relativebid-ask spread when errorannouncements are published

All (cumulative) abnormal bid-ask spreads are percentages

*/**/*** indicate significance levels of 10%, 5%, 1% of a two-sided t-test or a Wilcoxon signed-rank test

The analysis is now repeated for the individual year clusters in order to assess the development over time. The results can be found in Table 7.

It should first be noted that the clustering at this point results in a relatively small number of observations. The findings should therefore be interpreted with an appropriate degree of caution. However, by concentrating on the significant results, the overall tendency towards a negative abnormal relative trading volume can be supported here again. In particular, this effect can be observed for the first two clusters until 2012, while in the third phase (2013–2019) the trading volume does not change significantly around the release of the error announcements.

5.3 Effects On Bid-Ask Spread

Finally, with regard to the short-term market effects of an error announcement, the effect on the bid-ask spread of the share was examined. The results for the pooled sample are presented in Table 8.

Increasing (relative) bid-ask spreads can be observed across all observation windows. For the longer three-day and five-day windows around the publication, respectively, these increases occur on a statistical significant level for the non-parametric tests. The relative bid-ask spreads increase in mean by about 0.2%-0.3%. This result is also generally in line with that of Hitz et al. (2012), whereby they report a larger increase in the bid-ask spread of 0.8% in the window [-2; 2] (with a lower number of observations).

Event	2006–2008		ABAS 2009–2012		2013-2019	
window	(n = 52)		(n=81)		(n = 71)	
	Mean	Median	Mean	Median	Mean	Median
[-2; 2]	0.943**	0.116***	0.222	-0.003	-0.316	0.003
[-1; 1]	1.008*	0.091**	0.071	0.032	-0.302	0.013
[0]	1.109*	0.085	0.046	0.028	-0.152	0.019
[0; 1]	1.646	0.162*	0.048	0.035	-0.396	0.020

 Table 9
 Changes in the relative bid-ask spread when error announcements are published for different year clusters

All reported (cumulative) abnormal bid-ask spreads in percent

*/**/*** indicate significance levels of 10%, 5%, 1% of a two-sided t-test or a Wilcoxon signed-rank test

Again, the analysis is repeated for the individual year clusters in order to assess the development over time. The results are displayed in Table 9.

Interestingly, as can be seen in Table 9, the effect now strongly decreases over time in the clustered sample. While in the initial phase a significant widening of the bid-ask spread can be observed, especially on the publication date itself, this effect weakens considerably in the second annual cluster and then no longer occurs at a significant level. Even if the reported figures are already relative changes of the bidask spread (see Sect. 4.3 for the methodology), differences e.g. in the composition of the investigated companies might be relevant here.

6 Information Content of Error Announcements and Investors' Adaptation Process

Summing up the univariate results, it can be concluded that error announcements are still perceived as new and negative information by the capital market. As a result, the company's share price and trading volume decrease, while the relative bid-ask spread increases. The sanctioning effect of the German enforcement system through "adverse publicity", which is inherent in the system, thus can be found.

Based on these results, it is now examined which company and especially error specific characteristics have an explanatory power for these capital market reactions and are thus of particular importance for the capital market in interpreting and evaluating the information content of an error announcement. The analyses are again performed initially for the pooled sample (covering the entire observation period) and then individually for three year clusters since the relatively constant value of the reactions does not necessarily mean that the interpretation itself (or the processing of the information) by the investors has not changed during this time. For this purpose, several multivariate regression analyses are performed in the following section, each including the (control) variables previously described in Sect. 4.4. In all models, the cumulated abnormal return from the event window [-1; 1], determined by the market model, were used as the dependent variable. The market model is chosen because it is generally attributed the highest explanatory content in comparison with the two other models (Brown and Warner 1980), whereby the previously conducted analyses show that the corresponding results are also robust to alternative model specifications.

6.1 Pooled Sample

The results of the regression analyses for the pooled sample are presented in Table 10. A total of 6 different regression models are examined. The first model is based on the previous study by Hitz et al. (2012) with regards to the examined variables, whereby it should be noted that individual variables were defined slightly different. Likewise, two-sided statistical tests were used throughout the regression analyses. The models 2–6 analyze additional aspects of the specific characteristics of the identified accounting errors. This is firstly done insulated, with only including the variables related to the error characteristics (model 2) and then (models 3–6)

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Exam. character	istics					
BaFin	1.285 (1.293)	0.817 (1.020)	1.578 (1.285)	1.197 (1.297)	0.997 (1.283)	1.224 (1.275)
Delay	-0.257 (0.192)	-0.190 (0.160)	-0.274 (0.190)	-0.236 (0.192)	-0.141 (0.195)	-0.160 (0.193)
Pre-notifica- tion	-	1.580 (1.105)	0.775 (1.236)	0.693 (1.248)	0.930 (1.236)	1.070 (1.225)
Error characteris	stics					
Severity	-1.212* (0.664)	-0.152 (0.511)	-0.739 (0.685)	-1.063 (0.669)	-1.140* (0.655)	-0.695 (0.678)
Individual statement	-0.174 (1.096)	-0.758 (0.830)	0.071 (1.087)	-0.021 (1.098)	-0.055 (1.080)	0.163 (1.976)
Notes	-	1.710** (0.787)	2.135** (0.916)	-	-	1.976** (0.918)
Profit	-	0.410 (0.796)	-	-1.375* (0.891)	_	-0.275 (0.952)
Judgment	-	-2.392*** (0.791)	-	-	-2.280*** (0.895)	-2.075** (0.956)
Company Charae	cteristics					
Accounting policy	-0.079 (0.090)	-	-0.087 (0.089)	-0.077 (0.089)	-0.065 (0.089)	-0.072 (0.088)
Change	1.694** (0.895)	-	1.874** (0.888)	1.700** (0.894)	1.609* (0.882)	1.797** (0.876)
Growth	0.127 (0.321)	-	0.162 (0.317)	0.162 (0.320)	0.195 (0.317)	0.226 (0.314)
ListingDuration	-0.011 (0.017)	_	-0.015 (0.018)	-0.011 (0.018)	-0.016 (0.018)	-0.018 (0.017)
MarketCap	0.166 (0.202)	_	0.223 (0.201)	0.141 (0.202)	0.144 (0.199)	0.195 (0.199)
Leverage	-0.000 (0.000)	_	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)
Free float	0.028 (1.565)	_	0.285 (1.555)	0.255 (1.576)	0.336 (1.550)	0.649 (1.543)
Constant	-1.824 (2.984)	0.777 (1.167)	-3.541 (3.037)	-0.121 (3.013)	-1.202 (2.947)	-2.699 (3.052)
Observations	157	200	157	157	157	157
Adj. R^2	0.001	0.068	0.026	0.006	0.033	0.053
F-Statistics	1.020	2.800***	1.321	1.193	1.410	1.580

Table 10 Results of the multivariate regressions

***/**/* indicate the 1%, 5% and 10% significance levels of a two-sided t-test

Robust standard errors are given in brackets below the regression coefficients

In all models, the dependent variable is the abnormal return (determined by the market model) in the event window [-1; 1] around the publication of the error announcement

with the additional inclusion of several control variables for other company specific characteristics.

With regard to the first regression model it can be noted that the results of the previous study can be confirmed at least to a limited extent also within the now available larger number of observations. The variable Severity in model 1, as before, has a negative coefficient at a significance level of 10% (two-sided). A positive significant influence of a change in the governance structure of the company (variable Change) can also be found. This effect can be observed robustly in all other examined models, while the significant influence of the variable Severity partially disappears. This finding can thus be interpreted in the context of previous studies which derive a connection between "management quality" and the quality of financial reporting (Demerjian et al. 2012). The capital market thus reacts positively if a previously perceived low management quality could possibly be increased by the undertaken changes. If the capital market interprets incorrect financial reporting as an expression of inadequate governance structures within the company, a change in this field can be seen as a signal that a transformation process has been initiated. Conversely, adherence to the previous governance structures could be interpreted to mean that the company has consciously accepted an "overstretching" in the interpretation of the underlying accounting standard in the case of the errors identified and is still seeking to justify this approach.

The findings concerning the variable *Judgment* also point into this direction. This variable is included in models 2, 5 and 6 and shows robust significant negative coefficients at 5% and 1% levels respectively in all of these models. Thus, the capital market reaction to such an error announcement is significantly more negative. Since the exercise of accounting discretion is always based on a deliberate process of weighing up various alternatives, the capital market could conclude that there is a deliberate intent to deceive, whereas other types of errors, such as missing information, are more likely to be negligently forgotten (Dechow et al. 2010). If such a critical discretionary decision has now been made in consultation with the board and has not been objected to by the auditor as well, the capital market could see an increasing need for changes in the relevant bodies in order to (re-)establish an effective corporate governance structure in the company (Callen et al. 2006). In principle, this finding also confirms previous results for the U.S. capital market, in which discretionary accounting errors also lead to more negative capital market reactions (Plumlee and Yohn 2010).

On a more general consideration, it can be stated that for other error characteristics, which are only partially operationalized by the variable *Severity*, a significant influence on the capital market reaction can be observed. Noteworthy are errors in the notes. The variable *Notes* has significant and positive coefficients in all three models in which it is included. The capital market reaction is thus attenuated and the capital market perceives corresponding errors as less serious. Frequent types of error in this area are missing information, which, however, usually do not have a direct impact on the company's financial situation.

The fact that especially the financial situation is of particular valuation relevance for the capital market (Inchausti 1997) is also shown by the findings regarding the variable *Profit*. At least in one of the models examined, this variable shows a significant coefficient; the capital market reaction is more negative if the accounting error affects the company's earnings.

The remaining variables examined in the regression models do not show a significant influence. In particular, the more negative capital market reactions previously observed by Hitz et al. (2012) cannot be found in the present sample, neither on enforcement examinations, which were carried out at the second level by the BaFin, nor on accounting errors regarding the individual financial statements of the company (which might affect especially the dividend payout). From a capital market perspective, the significance of the first level of error determinations by the FREP is thus comparable to that of the second level of error determinations by the BaFin (this contrasts with the presumption of poor oversight by the FREP, which ultimately led to its shutdown in 2022). Moreover, surprisingly, the variable *Pre-notification* also does not have a significant impact in any of the models. This might be explained by the rather varying range of information published in the context of corresponding disclosures. Very often, these disclosures are quite vague and hardly allow investors to assess (apart from a kind of "pre-warning") what the actual impact of the possible error finding might be.

6.2 Changes in the Interpretation of the Announcements

Interestingly the results of the multivariate regression analyses of the pooled sample show that quantitative, financial parameters play only a minor role for the investors' assessment of the errors. Instead, a number of more qualitative factors, which could nevertheless enable investors to draw possible conclusions about the background and potential underlying structural causes in the company, are more significant. Such an interpretation of the error notifications also strongly reflects the original conception of the enforcement system in 2004, which was intended to enable the clarification of disputed accounting issues "on an equal footing", especially at the first stage—and was only conditionally geared towards the detection of criminal accounting fraud (which in Germany is primarily the responsibility of the public prosecutor's office).

At the same time, however, these findings raise the question of the extent to which this "indirect" way of interpreting error announcements was already inherent in the capital market from the very beginning in 2004. In order to examine this more precisely, separate regressions are performed for the individual year clusters, each of which contains the error characteristics from the previous section as explanatory variables. For some observations, however, not all (control) variables could be collected. The number of observations is therefore slightly reduced in each group, compared to the univariate analyses in Table 10. The results are presented in Table 11.

When interpreting the results, it should again be noted that the enforcement system was originally never designed as a forensic audit of accounting. In this respect, the main objective has always been to ensure the correct application of (interpretable) accounting standards, but only to a very limited extent to uncover criminal accounting fraud. Nonetheless, some evidence suggests that parts of the stakeholders had a corresponding perception to the end (Berninger et al. 2023b). Consequently, it can be assumed that the (then new) enforcement system was perceived much more

		Time Span	
Variables	2006-2008	2009-2012	2013-2019
Pre-notification	5.431**	-0.374	1.209
	(2.070)	(2.153)	(1.708)
Severity	0.042	-0.063	-0.372
	(0.935)	(0.800)	(0.988)
Notes	2.689*	2.854*	0.105
	(1.385)	(1.442)	(1.413)
Profit	-0.800	0.250	0.195
	(1.692)	(1.318)	(1.416)
Judgment	-1.243	-2.768**	-2.304*
	(1.683)	(1.320)	(1.366)
Constant	-1.346	-0.235	-2.304
	(1.268)	(1.251)	(1.407)
Observations	50	82	68
Adj. R ²	0.122	0.074	-0.024
F-Statistics	2.370*	2.280*	0.680

Table 11 Results of the multivariate regressions for individual year clusters

***/**/* indicate the 1%, 5% and 10% significance levels of a two-sided t-test

Robust standard errors are given in brackets below the regression coefficients

In all models, the dependent variable is the abnormal return (determined by the market model) in the event window [-1; 1] around the publication of the error announcement

strongly and largely unanimously as an "all-inclusive" solution for full accounting transparency during the initial euphoria.

In fact, the interpretation of error announcements in the first year cluster straightly follows a theoretical intuition: At this time, the reaction can be significantly mitigated by an advance announcement, and the capital market can be attuned accordingly to the final announcement. In turn, errors that exclusively affect the notes are perceived as less serious due to their lack of relevance to earnings (and accordingly lead to a significantly lower negative capital market reaction). In contrast, errors that affect profits lead to more negative reactions with a negative coefficient.

Surprisingly, this way of perception of error announcements is changing significantly in the two later clusters. Investors then have more and more experience with the enforcement system (including its strengths and weaknesses). As a result, this interpretation changes—away from the (primarily monetary) *impact* of the error, to the (qualitative) *nature* of the error; together with any possible conclusions it may allow about the origin. Errors with strong influence from accounting discretion, where this professional judgement has been unduly applied, now lead to a highly significant-negative reaction. Compared to other categories of errors, such as missing information, which might negligently be forgotten (Dechow et al. 2010), such critical discretionary decisions should have been made in consultation with the Board and therefore appear more intended. In this regard, Palmrose et al. (2004) show that capital market reactions on accounting errors are significantly influenced by the existence of a fraudulent motive, while Plumlee and Yohn (2010) correspondingly find that discretionary accounting errors lead to more negative capital market reactions. Especially this potential weak governance is monitored particularly closely by investors (Iliev et al. 2021).

7 Summary and Conclusion

This study examines the short-term capital market effects of published accounting errors within the external German two-tier external enforcement system. For this purpose, 213 error announcements published in the years 2006 to 2019 were analyzed.

First, the publication of error announcements is still of high significance for the capital market and interpreted as value relevant information. Around the day of the announcement, abnormal stock returns, an abnormal decreasing in the relative trading volume and an abnormal widening of the relative bid-ask spread can be observed. Especially the latter two indicators are in particular an expression of an increasing information asymmetry in the capital market. A further breakdown into several year clusters shows that these reactions also remain relatively stable throughout the years of the enforcement system's existence. From a regulatory perspective, it can therefore be concluded that the concept of naming and shaming as a sanctions instrument is still effective within the German capital market. The corresponding findings of previous studies (Hitz et al. 2012) can be confirmed for a longer observation period and also prove to be relatively stable over time in terms of their magnitude.

When disentangling the influence of individual error characteristics on the capital market reaction, some more unexpected results can be observed: The "severity" of the error plays only a relatively minor role for the capital market reaction, while secondary factors also have a significant influence. More specifically, the longer the German enforcement system is in place, the more the interpretation of published errors changes. The investors might adapt to the characteristics of the enforcement system. While in the beginning the (primarily monetary) impact of the error is given higher weight, later the (qualitative) nature of the error plays an important role for the magnitude of the market reaction; especially when it allows possible conclusions about the origin of the error. Errors with strong exercise of accounting discretion, where this professional judgement has been unduly applied, now lead to a highly significant negative reaction. Therefore, as previously described by Karpoff et al. (2008) for the U.S. stock market, the signal effect of an error notification also in the German enforcement system goes beyond pure accounting errors. Rather, it acts as a general signal to the capital market to question the overall effectiveness of the governance structure generally present in a company. From a practitioner's perspective, this finding once again highlights the crucial importance of being transparent with addressees when it comes to errors in reporting. A clear and open communication can help as well as a (reliable) signal that any potential causes of errors have been identified and eliminated.

The time period analyzed in this study ends with the new German legislation, which came into force in 2022. From an academic perspective, this offers the opportunity to analyze possible adaptation processes to the newly changed enforcement framework in future research. Especially the coming years will also have to show

whether the new framework will actually lead to the expected improvements and how investors will adapt to the one-step enforcement process, which is carried out exclusively by BaFin from now on. Furthermore, subsequent research is needed to analyze how announcements of the initiation of an enforcement procedure and any intermediate steps will impact the capital market in the future.

8 Appendix

8.1 Variables Definition

The following sections provide a more detailed description of the background and the calculation of the control variables (Sect. 4.4). Furthermore, a summary of the variables and descriptions can be found in Table 12.

8.1.1 Error Characteristics

Intuitively, the accounting error's severity should strongly influence the capital market reaction. Therefore following Hitz et al. (2012), a Principal Component Analysis is used to aggregate the error's effect on both the firm's equity and debt position (as deviation of corrected and originally reported return on equity and leverage) as well as the number of errors into the variable Severity. The variable Individual statement reflects the different functions of the consolidated financial statement as an informational financial statement (Griewel 2006) and the individual financial statement's role e.g. for dividend payments, while the later therefore directly impacts the future cash flows to shareholders. Additionally, the variable *Profit* proxies if earning were misstated, reflecting that pricing in the stock market is primarily based on expected future cash inflows (Callen et al. 2006; Inchausti 1997). In turn, errors exclusively related to the notes have no direct impact on the future cash flows to shareholders but usually involve incomplete or missing information. The dummy variable Notes reflects that there might have been a lack of resources during the preparation of the financial statements or an insufficient understanding of the underlying accounting standards. Since several accounting standards leave the issuer a considerable latitude in professional judgement (Küting and Weber 2015), this subjective component can lead to situations that the same fact can be interpreted differently (Beyhs et al. 2012) with also literature and case laws differ (Hennrichs 2009). The variable Judgement is created by reviewing if the identified error has discretionary references, based on the categorization of Kuhner and Orthaus (2017).8 This affects numerous IFRS standards (Leibfried 2014). The German enforcement authorities examine these discretionary decisions—in contrast to other enforcement systems within the European

⁸ Since the description of the accounting errors are often not very detailed in the announcements, in some cases it has not been possible to make a completely clear-cut allocation. However, this limitation hardly reduces the informative value of the capital market reaction, since capital market participants also have only access to these limited information from the error announcement to assess the impact of the accounting error. The short-term capital market reaction thus expresses exactly this interpretation.

Variable	Definition			
Exam. characterist	ics			
BaFin	Dummy variable coded 1 if examination was transferred to the BaFin on the second stage			
Delay	Number of days between the filing date of the erroneous financial statements and the publication of the error announcement divided by 100			
Pre-notification	Dummy variable coded 1 if the examination has already been prior to the publica- tion of the final error announcement by the company			
Error characteristi	CS			
Severity	Compound variable, aggregating the (1) number of errors in the announcement, (2) effect of the errors on the return on equity, and (3) effect of the errors on the leverage by a Principal Component Analysis (based on Hitz et al. 2012)			
Individual finan- cial statements	Dummy variable coded 1 if the error is related to an individual financial statemen			
Notes	Dummy variable coded 1 of the error only concerns the Notes to the financial state- ment			
Profit	Dummy variable coded 1 if the profit was reported too high in the erroneous finan- cial statements			
Judgment	Dummy variable coded 1 if the error relates to a highly discretionary accounting standard (based on the classification of Kuhner and Orthaus 2017)			
Company Characte	eristics			
Accounting policy	Discretionary accruals derived as difference of actual accruals and expected accruals as predicted by the model of Kothari et al. (2005)			
Change	Dummy variable coded 1 if there has been a change in top management or auditor in the respective company between publication of the financial statements and error announcement			
Growth	Sales growth in the five-year period prior to the error announcement			
ListingDuration	Number of years the company has been listed on the stock exchange at the time of the error announcement			
Market Cap	Logarithmic market capitalization of the company in the month prior to the error announcement			
Leverage	Leverage, calculated as total liabilities over total assets			
Free float	Percentage of shares in free float			

Table 12	Description	of the	control	variables
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Union (Berger 2010). FREP in this regard does not want to weigh up the discretion of the company against its own, but rather take a range of acceptable opinions as a basis (Scheffler 2006). Only if the specific decision of the management lies outside of this range or the assumptions made by the company are contradictory, the discretionary decision is sanctioned (Kuhner and Orthaus 2017). Empirically, Plumlee and Yohn (2010) present evidence that this type of accounting error usually has a strong impact on a wrongly reported result.

8.1.2 Enforcement Procedure Characteristics

Regarding the enforcement procedure itself, the dummy variable *BaFin* indicates whether the examination was transferred to the BaFin on the second stage (if the

company e.g. refused to cooperate or disagreed with the result of the examination by the FREP). To control for the information relevance of the error announcement (e.g. have rumors may already flown into the capital market or the error may have been corrected in a subsequent statement), the variable *Delay* counts the days between filing of the erroneous statement and publication of the error announcement. Although neither FREP nor BaFin were allowed to announce the initiation of examinations, some companies voluntarily disclosed this information in advance. Hitz and Schnack (2019) examine these disclosures and find that contentious reviews were more likely to be pre-disclosed, and these advance disclosures can mitigate capital market reactions when errors are eventually announced. Therefore, following Hitz and Schnack (2019), a dummy variable *Pre-notification*, controlling if the examination was disclosed before the final error announcement, is included. Financial statements and other reports preceding the final announcement were therefore screened for such disclosures.

8.1.3 Company Characteristics

Finally, several control variables are included that reflect the financial situation and the governance structure of the company. Numerous previous studies (e.g. Dechow et al. 1996; Jones et al. 2008) link the enforcement of accounting standards to earnings management, while mainly focusing on the US and SEC actions. Böcking et al. (2015) confirm that German enforcement detects but weakly constrains earnings management post error-release. Thus to check if earnings management relates to error disclosures, the variably Accounting policy includes discretionary accruals (Dechow et al. 1995), determined using Jones' (1991) model, with the return on assets integrated following Kothari et al. (2005). The variable Change captures whether between filing of the statements and the error announcement a change in top management or auditor has taken place. Previous studies show, for example, a doubling of the probability that a CEO or CFO will leave the company after an accounting error has become publicly known (Arthaud-Day et al. 2006). Similarly, Brocard et al. (2018) provide evidence that companies which are affected by a disclosure of an accounting error are more likely to change their auditor afterwards. Growth captures the sales growth in the five-year period prior to the announcement, reflecting errors occur more frequently in growth phases due to resource shortages (Stice 1991). Empirical evidence shows that the readability of financial statements improves (Li 2008) and the probability of accounting errors decreases (Doyle et al. 2007) as the duration of public listing increases, reflecting a growing experience with preparing market-oriented accounting documents, such as required by IFRS. The variable ListingDuration therefore counts the number of years a company has been listed at the time of the error announcement. The variable MarketCap represents the logarithmic market capitalization of the company. Previous studies (e.g., Singhvi and Desai 1971; Buzby 1975; Lang and Lundholm 1993) indicate that corporate reporting quality typically improves with larger company size due to fixed cost degression (Alsaeed 2006). The capital structure of the company (debt-equity ratio) is used as a proxy for its risk. The corresponding control variable Leverage is included based on the end of the financial year preceding the reporting of the

error. The control variable *Free float* is included since controlling owners and large investors play a crucial role in corporate governance, enhancing the effectiveness of governance systems through their informal monitoring function (Shleifer and Vishny 1997).

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