Corporate Compliance Systems - The Effect on Risk, Performance and Firm Value

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- First Draft -

Abstract

This study examines the reported compliance activities of 112 publicly listed German firms over the years 2014 to 2017 and assesses their effect on firm risk, performance and value. We build a score that accounts for 24 different compliance-related items and find that higher reported compliance activity reduces downside (or tail) risk. Although firm performance is not affected by compliance, there is a positive effect on firm value measured via Tobin's Q. A principal component analysis shows that these beneficial compliance effects are mainly driven by institutionalized compliance components. Management-centric and externally-oriented compliance activities appear rather detrimental for reducing downside risk.

JEL Classification: G32, G34, M14, M4
Keywords: Compliance, downside risk, tail risk, performance, firm value

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1 Introduction

Compliance has become one of the many buzzwords of modern management parlance, often used in conjunction with corporate governance or risk management. Whereas governance refers to the structure of control within a firm and risk management comprises the measurement and mitigation of firm-wide risks, compliance is defined as the set of "processes by which an organization seeks to ensure that employees and other constituents conform to applicable norms - which can include either the requirements of laws and regulations or the internal rules of the organization" (Miller, 2017). As the compliance function does not establish these norms but rather accepts them as given, compliance is to a certain extent imposed from the outside, typically via governmental agents, and therefore considers the perspectives not necessarily of shareholders but of a broader group of stakeholders in the firm (Griffith, 2016).

Despite this inherent stakeholder perspective, compliance activities may nevertheless be expected to benefit also the shareholders of the firm, primarily via the reduction (or avoidance) of losses that might otherwise be triggered by the violation of norms or rules. As the origins of these losses tend to be non-financial by nature, so that compliance-related risks materialize rarely but may be extremely large if they do, corporate risk management systems have a difficult job detecting and managing them (Jagannathan, Ravikumar, and Sammon, 2017). Corporate executives have nevertheless recognized the importance of these risks and try to keep their devastating consequences under close scrutiny. Given the increasing attention being paid to compliance-related issues from practitioners, it is surprising that there has been only scant attempt to date at rigorously testing the relation between compliance activities and firm value, respectively firm risk. Our paper contributes to closing this gap.

To the best of our knowledge, our paper is the first to compile a score that measures firms' reported compliance activities. We select 24 different compliance-related items and check the firms' annual reports for mentioning them. A firm's total compliance score is then defined as the sum of the reported items and we calculate these scores for each year of our sampling period. To allow for a natural weighting of the different compliance components in the score, we run a principal component analysis on the total list of items, out of which five different compliance factors are extracted that are used in subsequent tests.

After giving a detailed account of the compilation of the compliance score, we set out to examine whether reported corporate compliance activity affects firm value. We consider two potential channels via which compliance may impact firm value. The first relates to the mitigation of risks: If compliance activities help to curb or avoid behavior that violates laws, regulations or norms, the corresponding losses (e.g. from the paying of fines or damage claims) will be curtailed. Given the

infrequent but large-size nature of these losses, this should show in a reduction of tail risks in the firms' return distributions. In our analysis, we measure downside risks both from equity-based risk proxies and from credit-based risk measures. The second channel via which compliance may affect firm value is by increasing operational efficiency. If operating processes are less often disrupted and supply chains run more smoothly due to better compliance, firm performance will increase and this should eventually lead to a higher firm value. We measure performance using both return on equity and return on asset. Firm value is eventually measured via Tobin's Q.

Studying the empirical relation between compliance activities and firm value is far from trivial. This is due to endogeneity problems that might be caused by measurement errors, omitted variables, or, even more likely, reverse causality. As it is very difficult within simple regression analyses to differentiate between compliance causing a higher firm value or more profitable firms being able to invest more in compliance activity, we resort to a more elaborate methodological design: In our main analyses, we employ dynamic panel regressions following Arellano and Bover (1995) and Blundell and Bond (1998), where the lagged dependent variable accounts for simultaneity problems. As a robustness check, we also control for firm-fixed omitted variables in fixed-effects panel analyses in order to further alleviate problems of endogeneity.

Our results indicate that corporate compliance activity is indeed able to reduce downside risk: All of our equity-based proxies for downside risk decrease with increasing compliance score. Among the credit risk proxies, all but one show a decreasing effect of compliance activities on default risk. Even though we find no performance-enhancing effect of corporate compliance via return on assets or return on equity, we nevertheless see a positive effect on Tobin's Q. Firm value hence seems to be positively affected by higher reported compliance activity.

Examination of the different compliance factors that are retained from the principal component analysis shows that not all compliance-related activities are equally effective in reducing risk and increasing firm value. Rather, it seems that only those items are beneficial that contribute to a clear "institutionalization" of compliance within firms: the existence of a chief compliance officer, of a compliance committee on the board level, of a code of conduct, of an anonymized whistleblower facility, job rotation and a clear sanctioning of compliance violations. Softer factors such as the "compliance climate" among the employees do not seem to play a role and management-bound compliance aspects such as the "tone at the top" or compliance-related remuneration incentives for executives even appear to increase some proxies for downside risks.

Our findings hence not only underline the importance of effective compliance systems by quantifying their effects on firm risk and firm value. Our results also indicate that not all compliance activities are equally effective. Board members should be most concerned with establishing a rig-

orous set of internal compliance institutions with clear responsibilities and eventual sanctioning power. The establishment of softer compliance elements within the firm, in contrast, appears less relevant and trying to actively tie executive decisions to additional compliance activities may even lead to harmful incentives that may increase tail risks rather than reduce them. In order to better understand these detrimental effects of compliance-based management incentives, further research will be urgently needed.

The remainder of the paper proceeds as follows. Section 2 describes the dataset that we employ in our empirical study. Section 3 delineates the construction of the compliance score and presents a principal component analysis on its elements. Section 4 describes the econometric methodology used to derive the effect of compliance activity on downside risk, performance and firm value and presents the corresponding results. Section 5 describes the results of further robustness checks and Section 6 concludes the paper with a discussion of our results and an outlook on future research.

2 Data

Our raw dataset comprises all firms listed in the DAX30, MDAX, SDAX and TecDAX over the time period 2014 to 2017. We exclude financial firms as the financial industry is affected by much more extensive regulatory requirements, leaving financial institutions' compliance activities hardly comparable to those from other industries. For our sampling firms, we collect firm level data including performance variables and daily stock price returns via Datastream. Measures of credit risk, i.e. credit default swap (CDS) spreads[1] and distance to default (DtD), are downloaded from the Risk Management Institute of the National University of Singapore (NUS). Deleting firms with missing values regarding these dependent variables reduces our dataset to 448 firm-year observations based on 112 companies in our main analyses.

The dependent variables for our main analyses are based on the equity and credit market data. More precisely, we calculate the following four different equity-based proxies of downside risk to capture the nature of compliance-related risks as extreme events (Hoepner, Oikonomou, Sautner, Starks, and Zhou, 2016). First, we employ the value at risk (VaR) to measure the predicted maximum loss of a firm over a given horizon within a specific confidence interval (Jorion, 2007) and calculate it as the 0.05-quantile of the empirical daily stock return distribution. Since we are interested in downside risk, the negative return distribution marks the VaR threshold. Second, we use the expected shortfall or conditional value at risk ($CVaR$), which corresponds to the mean value

[1]It should be noted that the collected CDS spreads are "actuarial" spreads that do not contain any upfront fees, which is different from the notation of conventional CDS spreads.

of daily returns that fall below the VaR threshold. Finally, we also capture downside risks via lower partial moments (*LPMs*) of the second and third order *LPM(0,2)* and *LPM(0,3)*. We calculate these based on the return distribution below the 0%-return-threshold (Bawa, 1975; Fishburn, 1977). To be able to compare our results metrically, we calculate the square root of the LPM(0,2) and the cube root of LPM(0,3).

With regard to credit-based risk measures, which are, by definition, focused on default risk as a downside risk, we consider CDS spreads over 1 and 5 year periods and the corresponding probabilities of default (over 12 months and 60 months, respectively). We furthermore employ the distance to default as calculated with volatility-adjusted leverage based on Merton (1974). It measures the distance between the default point and the expected value of a firm's assets. Higher distance-to-default hence implies a lower probability of default. Finally, we also use Altman's Z-score which is an indicator of firm bankruptcy calculated as a weighted linear combination of five financial ratios.[2] A higher Z-score reflects a lower bankruptcy risk.[3]

Among the performance measures, we calculate the return on equity as the ratio of net income to the book value of equity and the return on assets as the ratio of net income to total assets. Finally, we employ Tobin's Q to asses the firm value. Defined as the market value of a firm divided by its replacement costs, Tobin's Q allows to make a statement whether the market over- respectively undervalues the company. We follow Chung and Pruitt (1994) and calculate Tobin's Q as the sum of the market capitalization of common stock, the liquidating value of the preferred stock and the book value of debt divided by total assets. Similarly to Luo and Bhattacharya (2006), Servaes and Tamayo (2013) and others, we employ Tobin's Q as a proxy for assessing the effect of management decisions, in our case compliance activities, on firm value.

All our empirical models include firm leverage (proxied by the debt-to-assets ratio), size (measured by the natural logarithm of the number of employees) growth (expressed with respect to sales), profitability (calculated as the operating income divided by total assets) and efficiency (proxied by the ratio of revenues to total assets) as control variables. We furthermore follow Hoepner, Oikonomou, Sautner, Starks, and Zhou (2016) and also control for the dividend yield.

Table 1 provides the descriptive statistics of our dependent and control variables. As can be seen, our dataset exhibits quite some volatility for most of the variables considered. We find that the average value at risk over the sampling period of 2014 to 2017 is a daily stock return decline of 2.9%, the mean expected shortfall is 4.1% and the mean one-year CDS spread is 5.9 basis points.

[2]The Altman Z-score is calculated as follows:

$$Z = 1.2 * \frac{\text{Working Capital}}{\text{Total Assets}} + 1.4 * \frac{\text{Retained Earnings}}{\text{Total Assets}} + 3.3 * \frac{\text{EBIT}}{\text{Total Assets}} + 0.6 * \frac{\text{Market Value Equity}}{\text{Book Value Long Term Debt}} + \frac{\text{Sales}}{\text{Total Assets}}$$

[3]It should be noted that data availability for our credit risk measures is limited so that the sample of firms is slightly reduced to 105 when analyzing the effect of compliance activity on credit-based risk measures.

The average return on assets is 6.1% and the average return on equity is 13%. At 1.4, the average Tobin's Q signals that the typical firm in our sample shows a 40% higher market valuation than its replacement value. At 54% the average leverage is relatively low in an international comparison, while sales growth and profitability come in at 5.2% and 6.9% respectively.

Table 1: Descriptive Statistics of the Dependent and Control Variables

This table provides descriptive statistics of the dependent and control variables in our analyses.

	Firm-year Observations	Mean	Std. dev.	Minimum	Maximum
VaR	448	2.85	0.86	0.56	6.20
CVaR	448	4.09	1.36	0.93	9.29
LPM(0,2)	448	1.83	0.61	0.45	4.61
LPM(0,3)	448	2.40	0.96	0.68	8.23
CDS1Y	420	5.91	9.40	0.01	96.62
CDS5Y	420	12.62	9.90	0.16	83.50
PD12month	420	0.0008	0.0014	0	0.01467
PD60month	420	0.0092	0.0074	0	0.06154
DtD	420	6.44	2.98	0.35	24.00
Altman Z-Score	448	1.86	0.95	-3.16	5.26
Return on Assets (%)	448	6.06	6.25	-15.8	53.58
Return on Equity (%)	448	13.00	20.16	-132.78	265.92
Tobin's Q	448	1.39	1.34	-0.11	10.17
Leverage	448	0.54	0.17	0.09	0.96
Sales Growth	448	0.05	0.16	-1.11	1.38
Profitability	448	0.07	0.08	-0.20	0.42
Dividend Yield (%)	448	2.00	1.62	0	10.65
Employees	448	44188	93633	255	642292
Efficiency	448	0.95	0.60	0.12	7.06

3 Compliance Score

Even though the definition of compliance in general terms seems to be unequivocal, there is no agreement on a list of necessary elements for an effective compliance system. Emphasis and level of detail rather vary from industry to industry and with regulatory context (Griffith, 2016). Instead of imposing a set of compliance criteria from the outset, our analysis therefore starts from the information provided by the firms in our sample and collects the different compliance-related items that these firms mention in their annual reports. Altogether, this delivers a list of 24 different aspects, ranging from hard factors such as the question of whether the company has established a compliance committee at the board level, has installed a chief compliance officer (CCO), employs a whistle-blowing hotline, uses job rotation or reports on the compliance systems of its suppliers to softer aspects such as whether the firm refers to a "tone at the top" in its annual report or

surveys employees with respect to the company's compliance culture. A full list of all 24 items is given in Appendix A.

In order to summarize all this information into a comprehensive measure of compliance, we construct dummy variables for each individual item indicating whether a company refers to this particular item in its annual report or not. Most of this information is found in the sustainability part of the annual report ("Nichtfinanzielle Erklärung") that publicly-listed German firms are obliged to file from 2017 on, though many do so even in earlier years. We nevertheless always check the full annual report for any compliance-related elements. We then summarize these indicator variables per company for each year in our sample.

Table 2 reports the descriptive statistics regarding this total compliance score. As can be seen from the table, the average total compliance score over all firms and years takes a value of 8.3. Disaggregating the total sample into the different indices, we see that DAX30-listed firms show much higher average and median compliance scores than companies listed in the other indices, which might have been expected as these are the largest publicly-listed firms in Germany. At the same time, however, there is hardly any variation in the average or median compliance scores per year for this subsample of firms whereas in the other indices the mean and median compliance score is the highest in the most recent year of our sampling period.

Table 2: Descriptive Statistics of the Compliance Score

This table illustrates descriptive statistics of the compliance score aggregated over the sample period 2014-2017 and also subdivided into the underlying indices DAX, MDAX, TecDAX, SDAX for each year individually.

	Mean	Median	Std. dev.	Minimum	Maximum
All	8.35	9	5.61	0	22
DAX					
2014	13.72	15	4.11	2	20
2015	14.55	15	3.63	4	21
2016	15	15	2.97	9	20
2017	14.93	15	2.89	10	22
MDAX					
2014	6.81	6	4.87	0	16
2015	9.23	10	4.74	0	18
2016	8	9	5.64	0	19
2017	9.84	11	5.18	0	19
TecDAX					
2014	3.79	3	3.20	0	11
2015	5.54	6	4.24	0	16
2016	5.45	5	3.66	0	14
2017	8.07	8	3.44	0	15
SDAX					
2014	3.93	3	4.00	0	12
2015	5.34	6	3.66	0	12
2016	5.80	6	4.64	0	16
2017	7.61	9	5.06	0	16

As a simple summary statistic, the total compliance score treats each of the individual items in a firm's compliance system as equally important. But clearly firms may view specific compliance components as much more important than others. Also, there may be certain relations between the different compliance items such that some may be established in groups or, on the opposite, be seen as substitutes. In order to allow for such structure to arise naturally from our list of compliance items, we run a principal component analysis on the 24 binary indicator variables in the compliance score. The principal component analysis employs the distance, respectively relatedness, between the itms in our compliance dataset to derive a weighting scheme (or loadings) that is used to compile different compliance "factors". These factors are orthogonal in the sense that they are linearly uncorrelated and therefore contain different explanatory content.

From the principal component analysis of our dataset, we retain five factors with meaningful eigenvalues larger than 1. Table 3 reports the corresponding factor loadings. Since the first factor loads strongly on all those compliance items that refer to an institutionalization of a compliance

system (i.e. existence of a CCO and a code of conduct, of a compliance committee at the board level, of an anonymized whistleblower facility, regular compliance trainings, internal compliance controls and penalization of infringements), we refer to this factor as the "institutionalized" compliance factor. Essentially, this factor contains all those compliance elements that contribute to a local anchoring of compliance activity and the corresponding responsibility within the firm. The second factor, in contrast, loads strongly on externally-oriented aspects of a compliance system: membership in the UN Global Compact, reporting of the whistleblowing activity, compliance check of suppliers and business partners. We denote this factor as the "external orientation" compliance factor. The third factor, referred to as "management" factor, loads strongly on the tone at the top and the question whether compliance aspects are considered for management compensation. The fourth factor, in contrast, relates to external standards and tests (i.e. compliance with the Principles for the Proper Performance of Reasonable Assurance Engagements Relating to Compliance Management Systems by the Institute of Public Auditors in Germany and existence of an external audit of the compliance system) and is therefore called the "outside standards" factor. Finally, the fifth factor loads heavily on internal aspects related to employees' compliance awareness such as job rotation and regular surveys regarding a compliance culture. It is referred to as the "internal culture" factor.

Table 3: Principal Component Analysis

This table presents the factor loadings for the five factors with eigenvalues larger than 1 from a principal component analysis on the 24 compliance items.

Variable	Factor1	Factor2	Factor3	Factor4	Factor5
COSO	0.2279	0.2159	0.0672	0.3321	-0.214
GLOBALCO T	0.1471	0.7175	0.2192	0.067	0.1852
IDWPS980	0.0538	0.2178	-0.095	0.7616	0.1133
CCO	0.6537	0.0777	0.1537	0.1464	-0.067
C_ORG	0.547	0.0361	0.3296	0.112	0.1786
BOARD	0.4918	-0.248	0.0111	0.2182	0.4423
TRAINING	0.7323	0.2789	-0.071	0.0696	0.034
COC	0.642	0.1823	-0.159	0.0856	-0.015
TONE	0.1389	0.0705	0.7783	-0.012	0.0268
ROTATION	0.0368	0.203	0.1909	0.198	0.6002
RISK	0.4188	0.4374	0.164	0.1841	0.1692
WHISTLE NT	0.5937	0.293	0.1328	-0.01	0.017
WHISTLE XT	0.4914	0.4028	0.2945	0.0354	-0.03
WHISTLE_ D	0.1424	0.0609	-0.018	0.0182	0.0476
WHISTLE_ N	0.6638	0.3147	0.1581	-0.025	-0.002
WHISTLE HT	0.158	0.5495	0.2105	0.2659	-0.1
CON_INT	0.5916	0.1206	0.1732	0.2171	0.1961
CON_EXT	0.1297	-0.006	0.163	0.7949	-0.028
SUP	0.3482	0.6733	0.0758	0.1291	0.0552
SUP_COC	0.1817	0.714	-0.038	0.0267	0.0469
CULT_CHECK	0.0296	0.1475	-0.062	-0.085	0.694
INCENT	0.0089	0.1789	0.746	0.1056	0.0111
SANCT	0.4583	0.3566	0.2334	0.2342	0.0731
C_CULT	0.1617	0.064	0.2711	0.2018	0.0577

4 Empirical Methodology and Results

4.1 Methodology

Our main analyses employ dynamic panel regressions that are estimated with a system GMM approach following Arellano and Bover (1995) and Blundell and Bond (1998). Statistical inference is based on robust standard errors introduced by Windmeijer (2005). This dynamic panel estimation method is suitable in contexts where the left-hand-side variable is dynamic, i.e. dependent on its past realizations, and where the right-hand-side variables may be correlated with past or even current realizations of the error term. Our model hence adresses these endogeneity concerns and can be illustrated as follows:

$$y_{i,t} = \beta_1 * y_{i,t-1} + \beta_2 x_{i,t} + \beta_3 \phi_{i,t} + \upsilon_i + \varphi_t + \epsilon_t \quad (1)$$

$y_{i,t}$ represents the respective left-hand-side variable (downside risk, performance, firm value) on which to evaluate the impact of compliance activity. $y_{i,t-1}$ represents the lagged dependent variable and $x_{i,t}$ is a vector of potential control variables. $\phi_{i,t}$ represents the compliance score, so that the coefficient β_3 demonstrates the impact of compliance activity on firm risk, performance or firm value. υ_i and φ_t are time-constant firm effects and firm-constant time effects that are unobservable. ϵ_t denotes the error term in the regression. We report two-step estimation results with a heteroscedasticity-based weighting matrix. Level variables are instrumented with lagged first-differenced terms in this approach.

4.2 Effects of the Total Compliance Score

Table 4 provides system GMM estimates of the dynamic panel regression where the four different equity-based proxies for downside risk are employed as dependent variables. The regressions control for a wide range of factors that may affect downside risks beyond compliance activity, following Hoepner, Oikonomou, Sautner, Starks, and Zhou (2016). As more debt tends to increase the volatility of firms' earnings, we control for differences in financial leverage. A similar reasoning holds for growth, so that we also account for sales growth and profitability. We also include the dividend yield and the (natural logarithm of the) number of employees among the control factors.

As can be seen from the table, a higher compliance score goes along with a significant reduction in all downside risk measures. In this respect, firms that report higher compliance activity show lower tail risks. The coefficients indicate that value at risk decreases by about 18% and expected shortfall by about 19% for each additional unit increase in the compliance score. Similarly, the lower partial moments imply that negative returns become significantly less dispersed for firms with higher compliance activity. Among the control factors, only the financial leverage shows the expected (positive) effect on equity-based downside risks.

Table 4: Compliance and Equity-Based Downside Risks

This table presents the dynamic panel estimation of the effects of the total compliance score on different proxies for equity-based downside risk. Coefficients are estimated using the two-step Arellano and Bover (1995) and Blundell and Bond (1998) system GMM estimator. The dependent variables are VaR in model (1), CVaR in model (2), LPM(0,2) in model (3) and LPM(0,3) in model (4). Standard errors are robust and reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

	(1) VaR	(2) CVaR	(3) LPM(0,2)	(4) LPM(0,3)
L. Dep. Var	0.302	-0.236	0.289	0.322
	(0.232)	(0.314)	(0.328)	(0.207)
Compliance Score	-0.179***	-0.189***	-0.0846***	-0.0772**
	(0.0429)	(0.0688)	(0.0245)	(0.0338)
Leverage	2.932*	5.298***	1.623*	1.830
	(1.505)	(1.925)	(0.858)	(1.281)
Sales Growth	0.0210	-0.852	0.0403	0.274
	(0.682)	(0.713)	(0.409)	(0.703)
Profitability	-1.360	1.773	-0.627	-3.334
	(3.341)	(4.862)	(2.250)	(3.747)
Dividend Yield	0.0988	0.0858	0.0620	0.0783
	(0.0720)	(0.176)	(0.0685)	(0.0795)
Employees	0.217	2.100*	0.0314	-0.362
	(0.277)	(1.144)	(0.456)	(0.528)
Constant	0.0271	-15.36	0.969	4.841
	(2.099)	(9.475)	(3.566)	(4.245)
Firm-year Obs.	336	336	336	336
Obs.	112	112	112	112
χ^2	39.04	25.52	30.37	23.13

Table 5 presents the results from a system GMM estimation on the different proxies for credit risk as dependent variables. Here, we see that all the market-based measures of default risk show a significantly reducing effect of compliance: For example, an increase in the total compliance score by one more point reduces the one-year CDS spread by 0.2 basis points and the five-year CDS spread by 0.3 basis points. The probabilities of default over the same time periods decrease correspondingly and the distance to default increases. Hence, the higher the reported compliance activity of a company, the lower turns out to be its credit risk. Only the Altman Z-score, which is based on balance-sheet ratios, does not appear to be significantly affected by corporate compliance activities. As might have been expected, leverage has a positive impact on credit risk measured over a 12-months period while the dividend yield shows a mainly negative effect.

Table 5: Compliance and Credit Risks

This table presents the dynamic panel estimation of the effects of the total compliance score on different proxies for credit risk. Coefficients are estimated using the two-step Arellano and Bover (1995) and Blundell and Bond (1998) system GMM estimator. The dependent variables are the CDS spread over 1 year in model (1), CDS spread over 5 years in model (2), probability of default over 12 months in model (3), probability of default over 60 months in model (4), distance to default in model (5) and Altman's z-score in model (6). It should be noted that the estimation of PD12 months refers to the one step estimator. Standard errors are robust and reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

	(1) CDS1Y	(2) CDS5Y	(3) PD12month	(4) PD60month	(5) DTD	(6) Altman
L. Dep. Var	0.0357	0.221	-0.0230	0.230	0.121	0.576*
	(0.0715)	(0.151)	(0.221)	(0.151)	(0.257)	(0.316)
Compliance Score	-0.237**	-0.310*	-3.26e-05*	-0.000240**	0.245**	0.00504
	(0.120)	(0.159)	(1.92e-05)	(0.000119)	(0.105)	(0.00459)
Leverage	23.95**	21.01	0.00439**	0.0151	-7.271	-0.0170
	(10.79)	(16.42)	(0.00219)	(0.0121)	(5.387)	(1.248)
Sales Growth	-3.172	2.548	-0.000826	0.00207	-2.935	0.357
	(4.073)	(5.512)	(0.00110)	(0.00410)	(2.358)	(0.244)
Profitability	-8.748	-32.79	-0.000614	-0.0248*	15.76	2.465***
	(14.00)	(20.30)	(0.00287)	(0.0150)	(10.10)	(0.933)
Dividend Yield	0.830**	0.852**	8.84e-05	0.000632**	-0.226	0.00568
	(0.325)	(0.413)	(0.000120)	(0.000311)	(0.191)	(0.0151)
Employees	1.789	2.303	0.000218	0.00185	-1.028	-0.180
	(2.910)	(3.280)	(0.000628)	(0.00238)	(0.818)	(0.121)
Constant	-22.88	-19.73	-0.00336	-0.0158	16.16**	2.252*
	(22.01)	(24.17)	(0.00554)	(0.0176)	(7.364)	(1.167)
Firm-year Obs.	315	315	315	315	315	336
Obs.	105	105	105	105	105	112
χ^2	42.86	43.41	19.87	45.68	12.31	35.39

Table 6 finally presents the results from the system GMM estimation on accounting performance measures and Tobin's Q as proxy for firm value. Though there is no significant effect of the compliance score on either RoA or RoE, implying no improvement in performance due to stronger compliance activity, there is a positive effect on Tobin's Q. The market hence appears to assign a higher market value to firms that report higher compliance activity: An increase in the total compliance score by one additional item increases Tobin's Q by 3.6%.

Table 6: Compliance, Performance and Firm Value

This table presents the dynamic panel estimation of the effects of the total compliance score on firm performance and value. Coefficients are estimated using the two-step Arellano and Bover (1995) and Blundell and Bond (1998) system GMM estimator. The dependent variables are return on assets in model (1), return on equity in model (2) and Tobin's Q in model (3). Standard errors are robust and reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

	(1) RoA	(2) RoE	(3) Tobin's Q
L. Dep. Var	0.0390	-0.0113	0.107
	(0.0591)	(0.408)	(0.227)
Compliance Score	0.101	0.564	0.0361**
	(0.0693)	(0.543)	(0.0142)
Leverage	-24.25***	-30.53	0.400
	(5.374)	(20.29)	(1.017)
Sales Growth	3.857**	-7.778	0.0665
	(1.836)	(21.31)	(0.337)
Profitability	43.94***	121.9**	2.934
	(8.669)	(53.01)	(2.506)
Efficiency	1.246	2.577	-0.102
	(0.875)	(20.57)	(0.260)
Employees	-1.515	1.305	-0.695**
	(1.632)	(10.20)	(0.282)
Constant	27.84	1.270	7.135**
	(17.33)	(98.13)	(3.020)
Firm-year Obs.	336	336	336
Obs.	112	112	112
χ^2	61.27	18.02	24.17

4.3 Effects of the Individual Compliance Factors

In order to understand which elements of a corporate compliance system drive the observed effects on downside risk and firm value, we next consider the individual compliance factors that are generated via the principal component analysis. Essentially, we repeat the earlier analyses from tables 4 to 6 but replace the total compliance score with the five individual compliance factors as main explanatory factors. For reasons of brevity, we only report the coefficients of these five compliance scores in the following tables even though the analyses contain the same set of control variables as before.

Table 7: Individual Compliance Factors and Downside Risk

This table provides the dynamic panel estimations of the effects of the individual compliance factors on equity risks (Panel A), credit risks (Panel B). Coefficients are estimated using the two-step Arellano and Bover (1995) and Blundell and Bond (1998) system GMM estimator. Standard errors are robust and reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Panel A: Equity-Based Risks

	(1) VaR	(2) CVaR	(3) LPM(0,2)	(4) LPM(0,3)
Factor_Inst	-0.419***	-0.473**	-0.213***	-0.227***
	(0.130)	(0.209)	(0.0684)	(0.0767)
Factor_External	-0.315	-0.299	-0.157	-0.179
	(0.224)	(0.300)	(0.122)	(0.196)
Factor_Mgmt	0.431	0.583	0.363**	0.631***
	(0.359)	(0.554)	(0.181)	(0.242)
Factor_Outside Standards	0.0544	0.171	0.119	0.106
	(0.256)	(0.418)	(0.131)	(0.188)
Factor_Int. Culture	-0.142	0.201	0.0214	0.0323
Firm-year Obs.	336	336	336	336
Obs.	112	112	112	112
χ^2	31.90	31.95	35.73	31.71

Panel B: Credit Risks

	(1) CDS1Y	(2) CDS5Y	(3) PD12month	(4) PD60month	(5) DTD	(6) Altman
Factor_Inst	-1.162***	-1.617***	-0.000157**	-0.00121***	0.575*	0.0310*
	(0.387)	(0.472)	(6.69e-05)	(0.000358)	(0.328)	(0.0172)
Factor_External	1.626**	2.323**	0.000212	0.00170**	0.534	-0.0744
	(0.722)	(1.091)	(0.000191)	(0.000824)	(0.418)	(0.0472)
Factor_Mgmt	-0.739	0.279	-8.54e-05	0.000168	-0.406	0.0489
	(1.337)	(1.821)	(0.000228)	(0.00136)	(0.603)	(0.0551)
Factor_Outside Standards	-0.585	-0.687	-0.000101	-0.000527	-0.0143	-0.0360
	(0.697)	(0.867)	(0.000141)	(0.000658)	(0.533)	(0.0434)
Factor_Int. Culture	1.486	1.652	0.000187	0.00107	-0.660	-0.00640
Firm-year Obs.	315	315	315	315	315	336
Obs.	105	105	105	105	105	112
χ^2	49.11	52.99	25.07	54.36	19.12	51.81

As can be seen from Panel A in Table 7, the reducing effect of compliance on equity-based downside risks is clearly driven by the institutionalized compliance factor. We not only observe highly significantly positive coefficients of this factor in all regressions, but the size of the coefficient is also much larger than the size of the total score's coefficient in Table 4 above. Interestingly,

however, the management compliance factor also has a significant impact on some downside risk measures that is, however, positive. This implies that companies whose management conforms with a compliance-based tone at the top and that tailor their management remuneration systems towards compliance show higher tail risks, at least when approximated along lower partial moments, than companies that do not report such a strong management compliance factor.

With regard to credit risk, Panel B shows that the institutionalized compliance factor again lowers tail risks approximated by all of our credit risk measures. Again, the effect of this individual factor is much stronger than the impact that we have observed from the total compliance score. This indicates that not only are the different elements of a compliance system not equally effective. Rather, some compliance activities may be actually detrimental to reducing downside risks. And indeed, we see that the external orientation factor of the compliance score increases both short- and long-term CDS spreads and long-term probability of default. Compliance activities that are mainly oriented to the outside, either via external communication (here: of whistelblower activities), via the monitoring of the compliance systems of business partners or via membership in the UN Global Compact, hence appear to raise the default risk perceived by the capital markets, particularly over the longer-term, 5 year period.

Table 8: Individual Compliance Factors, Firm Performance and Value

This table provides the dynamic panel estimations of the effects of the individual compliance factors on firm performance and value. Coefficients are estimated using the two-step Arellano and Bover (1995) and Blundell and Bond (1998) system GMM estimator. Standard errors are robust and reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Panel C: Performance and Firm value

	(1) RoA	(2) RoE	(3) Tobin' s Q
Factor_Inst	0.397**	1.033	0.0623
	(0.182)	(1.198)	(0.0402)
Factor_External	-0.558	1.039	0.0939
	(0.476)	(2.094)	(0.0710)
Factor_Mgmt	0.489	-4.926	0.0799
	(0.688)	(7.355)	(0.111)
Factor_Outside Standards	0.508	4.141	-0.0463
	(0.407)	(5.090)	(0.0783)
Factor_Int. Culture	0.713	2.405	0.00937
Firm-year Obs.	336	336	336
Obs.	112	112	112
chi2	84.03	27.90	26.06

Finally, Table 8 indicates that the institutionalized compliance factor significantly increases firm performance via the return on assets. The effect of this compliance factor on Tobin's Q is only very weakly significant (at the 12% level of significance).

This more detailed analysis seems to indicate that not all elements of a compliance management system are equally effective. Rather, it is predominantly the institutionalized elements that allow to reduce downside risks and raise performance. Softer factors such as management incentives supporting compliance issues or a stronger emphasis on a compliance-related tone at the top appear to be even counter-productive as they may lead to a greater uncertainty on equity markets. A similar result is derived for compliance elements that are predominantly externally oriented. These induce market-based proxies of credit risk to increase, particularly over the longer term.

5 Robustness Checks

While the dynamic panel estimation with a system GMM approach is particularly suited to alleviate endogeneity concerns stemming from autocorrelation and reverse causality, the problem of omitted variables remains. In order to raise the internal validity of our results, we therefore apply a fixed-effects panel estimation method as a further robustness check. This method allows to avoid problems stemming from unobserved characteristics that are firm-specific and constant over time. Essentially, by employing a fixed-effects panel estimation method, we avoid our results being driven by characteristics such as industry-specific risks, firm-specific business models or management-specific attitudes - aspects that tend to be rigid over our sampling period - instead of the compliance activities that the firms choose.

As can be seen from the following tables, our results are robust against this alternative estimation method. I.e. higher compliance activities robustly reduce downside risks, both based on equity and credit markets, and increase firm value. We even find a weakly significant and positive effect of the total compliance score on the return on equity.

Table 9: Robustness Check: Compliance and Equity-Based Downside Risks

This table presents fixed-effects estimation of the effects of the total compliance score on different proxies for equity-based downside risk. The dependent variables are CVaR in model (1), VaR in model (2), LPM(0,2) in model (3) and LPM(0,3) in model (4). Standard errors are robust and reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

	(1) CVaR	(2) VaR	(3) LPM(0,2)	(4) LPM(0,3)
Compliance Score	-0.0880***	-0.0748***	-0.0378***	-0.0449***
	(0.0211)	(0.0117)	(0.00878)	(0.0157)
Leverage	1.311	1.406**	0.418	0.333
	(1.059)	(0.685)	(0.480)	(0.744)
Sales Growth	-0.896***	-0.306	-0.296**	-0.559**
	(0.341)	(0.271)	(0.149)	(0.242)
Profitability	1.057	0.429	0.0782	0.578
	(3.207)	(1.333)	(1.273)	(2.354)
Dividend Yield	0.0993	0.0454	0.0388	0.0927
	(0.0739)	(0.0366)	(0.0309)	(0.0606)
Employees	0.892**	0.235	0.245	0.572**
	(0.415)	(0.262)	(0.174)	(0.284)
Constant	-4.359	0.504	-0.400	-2.908
	(3.834)	(2.521)	(1.612)	(2.632)
Firm-year Obs.	448	448	448	448
Obs.	112	112	112	112
R^2	0.082	0.114	0.067	0.051

Table 10: Robustness Check: Compliance and Credit Risks

This table presents the fixed-effects estimation of the effects of the total compliance score on different proxies for credit risk. The dependent variables are the CDS spread over 1 year in model (1), CDS spread over 5 years in model (2), probability of default over 12 months in model (3), probability of default over 60 months in model (4), distance to default in model (5) and Altman's z-score in model (6). Standard errors are robust and reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

	(1) CDS1Y	(2) CDS5Y	(3) PD12month	(4) PD60month	(5) DTD	(6) Altman
Compliance Score	-0.351**	-0.376**	-5.33e-05**	-0.000287**	0.180***	0.000470
	(0.146)	(0.146)	(2.23e-05)	(0.000110)	(0.0376)	(0.00586)
Leverage	21.71**	21.45**	0.00323**	0.0158**	-5.406**	-0.736
	(9.020)	(9.767)	(0.00136)	(0.00723)	(2.530)	(0.654)
Sales Growth	-12.72*	-8.012	-0.00197**	-0.00581	0.134	-0.113
	(6.568)	(5.941)	(0.000994)	(0.00441)	(1.388)	(0.225)
Profitability	-15.65	-15.50	-0.00239	-0.0116	5.908	3.068***
	(16.96)	(17.09)	(0.00254)	(0.0126)	(4.902)	(0.987)
Dividend Yield	0.240	0.385	3.18e-05	0.000280	-0.129	0.0153
	(0.554)	(0.511)	(8.36e-05)	(0.000381)	(0.120)	(0.0238)
Employees	5.380	8.540*	0.000753	0.00636*	-1.268*	0.0247
	(5.428)	(4.581)	(0.000829)	(0.00332)	(0.709)	(0.173)
Constant	-51.50	-74.51*	-0.00725	-0.0555*	19.34***	1.785
	(47.25)	(40.17)	(0.00721)	(0.0291)	(6.540)	(1.748)
Firm-year Obs.	422	422	420	420	423	448
Obs.	106	106	105	105	107	112
R^2	0.157	0.129	0.161	0.128	0.098	0.150

Table 11: Robustness Check: Compliance, Performance and Firm Value

This table presents the fixed-effects estimation of the effects of the total compliance score on firm performance and value. The dependent variables are return on assets in model (1), return on equity in model (2) and Tobin's Q in model (3). Standard errors are robust and reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

	(1) RoA	(2) RoE	(3) Tobin's Q
Compliance Score	0.120	0.890*	0.0441***
	(0.0984)	(0.453)	(0.0116)
Leverage	-14.08***	-15.80	0.592
	(4.066)	(20.05)	(0.749)
Sales Growth	1.701	24.04	0.320
	(3.588)	(20.20)	(0.229)
Profitability	36.42**	87.31*	2.798
	(15.46)	(45.43)	(2.079)
Efficiency	1.734	-0.120	0.167
	(1.136)	(7.676)	(0.121)
Employees	-1.201	-20.72	0.0657
	(2.353)	(15.35)	(0.194)
Constant	19.52	199.8	-0.331
	(22.25)	(137.8)	(1.885)
Firm-year Obs.	448	448	448
Obs.	112	112	112
R^2	0.149	0.090	0.126

6 Conclusion

Based on a sample of 112 publicly-listed German firms over the years 2014 to 2017, we document the compilation of a corporate compliance score out of 24 different compliance-related activities. We observe that firms listed in the DAX30 show higher average compliance scores than firms listed in the MDAX, SDAX or TecDAX but that constituents of this lower indices exhibit stronger growth in their average compliance scores over the years of our sampling period.

We consider the effect of compliance on firm value via two channels: With regard to the first, we hypothesize that compliance-related risks materialize infrequently but that the ensuing losses are large in size; therefore, compliance activity may be expected to reduce downside or tail risks. Second, we postulate that stronger compliance activity increases operating performance. We examine the relation between corporate compliance on the one hand and risk, performance and value on the other hand via dynamic panel estimations and fixed-effect panel estimations. Both methods are suited for dealing with endogeneity concerns that may arise due to autocorrelation,

reverse causality or omitted variables. Our analyses derive the robust result that higher compliance activity reduces both equity-based downside risk and credit risk and increases firm value.

Splitting the total compliance score into different factors based on a principal component analysis allows to draw even more detailed conclusions regarding the effectiveness of individual compliance elements. As such, we find that it is mainly the institutionalized elements of corporate compliance systems that derive the beneficial result of reducing tail risks. This result underlines the importance of anchoring compliance activities clearly within the institution, so that both the compliance function and the responsibility for compliance activities have a clear location inside the firm. For instance, the establishment of the position of a chief compliance officer, of a compliance committee on the board level, of an anonymized whistleblower facility, of regular compliance trainings, of internal compliance controls and of a clear sanctioning mechanism are conducive in this respect. Interestingly, management-centric compliance elements, for instance via compliance-related management compensation, and externally-oriented compliance activities such as reporting on the activity of the whistleblower facility or compliance controls of suppliers and business partners, tend to increase tail risks. Our findings hence indicate that an effective corporate compliance system needs to be built carefully. Particularly, undesired (management) incentive effects and outside perceptions need to be considered with extreme caution to avoid detrimental repercussions of well-intended compliance activities.

References

Arellano, M., and O. Bover (1995): "Another look at the instrumental variable estimation of error-components models," *Journal of Econometrics*, 68(1), 29–51.

Bawa, V. S. (1975): "Optimal rules for ordering uncertain prospects," *Journal of Financial Economics*, 2(1), 95–121.

Blundell, R., and S. Bond (1998): "Initial conditions and moment restrictions in dynamic panel data models," *Journal of Econometrics*, 87(1), 115–143.

Chung, K. H., and S. W. Pruitt (1994): "A Simple Approximation of Tobins q," *Financial Management*, 23(3), 70.

CRI (2019): "Credit Research Initiative of the National University of Singapore," http://rmicri.org, Retrieved on 2-27-2019.

Griffith, S. J. (2016): "Corporate Governance in an Era of Compliance," *William & Mary Law Review*, 57(6).

Hoepner, A. G. F., I. Oikonomou, Z. Sautner, L. T. Starks, and X. Zhou (2016): "ESG Shareholder Engagement and Downside Risk," *SSRN Electronic Journal*.

Jagannathan, R., A. Ravikumar, and M. Sammon (2017): "Environmental, Social, and Governance Criteria: Why Investors are Paying Attention," NBER Working Paper 24063.

Jorion, P. (2007): *Financial risk manager handbook*. John Wiley & Sons.

Luo, X., and C. B. Bhattacharya (2006): "Corporate Social Responsibility, Customer Satisfaction, and Market Value," *Journal of Marketing*, 70(4), 1–18.

Merton, R. C. (1974): "On the pricing of corporate debt: The risk structure of interest rates," *The Journal of Finance*, 29(2), 449–470.

Miller, G. P. (2017): *The Law of Governance, Risk Management, and Compliance*. Aspen Casebook Series.

Servaes, H., and A. Tamayo (2013): "The Impact of Corporate Social Responsibility on Firm Value: The Role of Customer Awareness," *Management Science*, 59(5), 1045–1061.

Windmeijer, F. (2005): "A finite sample correction for the variance of linear efficient two-step GMM estimators," *Journal of Econometrics*, 126(1), 25–51.

Appendix

COSO	Internal system of control follows COSO standard
UN Global Compact	Member of UN Global Compact
IDWPS980	Compliance system certified according to IDW PS 980
CCO	Existence of chief compliance officer (CCO) or other compliance officer
C_ORG	Company uses specific compliance organization
BOARD	Existence of compliance committee at board level
C_CULT	Compliance culture mentioned as essential factor of corporate culture
TONE	Executive team recognizes compliance as relevant component of tone at the top
CULT_CHECK	Regular employee surveys regarding compliance culture
TRAINING	Compliance trainings offered
COC	Existence of a code of conduct
SUP_COC	Existence of a code of conduct for suppliers
ROTATION	Job rotation
INCENT	Compliance is a target in management compensation system
RISK	Existence of a compliance risk assessment
SUP	Compliance check of business partners (customers, suppliers, licensees)
CON_INT	Internal compliance controls
CON_EXT	External compliance controls
WHISTLE NT	Existence of internal whistleblower facility (e.g. compliance officer, work council)
WHISTLE XT	Existence of external whistleblower facility (e.g. hotline)
WHISTLE_ D	Existence of an ombudsman as whistleblowing facility
WHISTLE_ N	Whistleblowing system guarantees anonymity
WHISTLE HT	Reporting of the whistleblowing activities
SANCT	Penalization of compliance infringements