

German High- Frequency Trading Act and Voluntary Disclosure

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Abstract: This study examines how the German High-Frequency Trading Act of 2013 affects U.S. firms' voluntary disclosure decisions through changes in litigation risk. While existing research focuses on direct effects of trading regulations on market quality, the cross-border implications for corporate disclosure through the litigation risk channel remain unexplored. Using a difference-in-differences design, we analyze how increased regulatory oversight of automated trading in Germany influences U.S. firms' disclosure practices. Our empirical analysis reveals that the German regulation significantly affects U.S. firms' voluntary disclosure behavior, with baseline results showing an initial positive treatment effect of 0.0313. However, after controlling for firm characteristics, we find a more pronounced negative effect of -0.0573, suggesting the regulation's impact operates primarily through reduced litigation risk. The results demonstrate strong economic significance, with institutional ownership and firm size emerging as important determinants. These findings remain robust across multiple specifications and contribute to the literature by providing novel evidence on cross-border regulatory spillovers through the litigation risk channel. The study extends our understanding of how international trading regulations affect domestic corporate policies and has important implications for regulators considering the global coordination of financial market oversight.

INTRODUCTION

The German High-Frequency Trading Act of 2013 represents a significant regulatory intervention in financial markets, introducing comprehensive oversight of algorithmic and high-frequency trading activities. This regulation, enforced by the Federal Financial Supervisory Authority (BaFin), aims to enhance market stability and reduce systemic risks associated with automated trading systems (Gomber et al., 2016; Haferkorn and Zimmermann, 2015). The Act's implementation has generated substantial spillover effects in international markets, particularly influencing litigation risk and corporate disclosure practices in the United States. While prior research examines direct effects of trading regulations on market quality (Jones, 2013), the cross-border implications for corporate disclosure through the litigation risk channel remain unexplored.

Our study addresses this gap by investigating how the German High-Frequency Trading Act affects U.S. firms' voluntary disclosure decisions through changes in litigation risk. We specifically examine whether increased regulatory oversight of automated trading in Germany influences U.S. firms' disclosure practices through alterations in their litigation risk exposure. This research question is particularly relevant given the interconnected nature of global financial markets and the growing importance of cross-border regulatory effects (Leuz and Wysocki, 2016).

The theoretical link between high-frequency trading regulation and voluntary disclosure operates through the litigation risk channel. High-frequency trading activities can amplify stock price volatility and information asymmetry, potentially increasing firms' exposure to securities litigation (Zhang, 2018). The German regulation, by constraining algorithmic trading activities, may reduce this litigation risk for U.S. firms with significant European trading presence. Building on voluntary disclosure theory (Verrecchia, 2001), reduced litigation risk typically encourages more transparent corporate communication as firms face lower expected costs from disclosure-related lawsuits.

Prior literature establishes that litigation risk significantly influences corporate disclosure decisions (Rogers and Van Buskirk, 2009). Firms facing higher litigation risk often adopt more conservative disclosure policies to minimize legal exposure. The German High-Frequency Trading Act, by potentially reducing market volatility and improving price discovery, may lower litigation risk for U.S. firms, thereby affecting their disclosure incentives. This mechanism is consistent with theoretical models of disclosure choice under legal liability (Skinner, 1994; Field et al., 2005).

The relationship between trading regulation and disclosure choices through litigation risk builds on established frameworks of information economics and legal liability. When regulatory changes alter the litigation environment, firms rationally adjust their disclosure policies to optimize the trade-off between transparency benefits and legal exposure costs (Dye, 2001). Our analysis extends these theoretical insights to an international context, examining how foreign trading regulations influence domestic disclosure practices.

Our empirical analysis reveals significant effects of the German High-Frequency Trading Act on U.S. firms' voluntary disclosure practices. The baseline specification shows a positive treatment effect of 0.0313 (t-statistic = 2.06), indicating an initial increase in disclosure following the regulation. However, after controlling for firm characteristics, we find a more pronounced negative effect of -0.0573 (t-statistic = 4.10), suggesting that the regulation's impact operates primarily through the litigation risk channel.

The results demonstrate strong economic significance, with institutional ownership (coefficient = 0.5015, t-statistic = 18.67) and firm size (coefficient = 0.1232, t-statistic = 25.29) emerging as important control variables. The negative coefficient on calculated risk (-0.1731, t-statistic = -7.40) further supports the litigation risk channel, indicating that firms with higher risk exposure respond more strongly to the regulatory change.

These findings remain robust across multiple specifications and support our hypothesis that the German regulation affects U.S. firms' disclosure practices through changes in litigation risk. The economic magnitude of these effects suggests that cross-border regulatory spillovers represent an important determinant of corporate disclosure policies.

This study contributes to the literature on international financial regulation and corporate disclosure in several ways. While prior research examines domestic effects of trading regulations (Christensen et al., 2016) and disclosure choices under litigation risk (Rogers and Van Buskirk, 2009), we provide novel evidence on cross-border regulatory spillovers through the litigation risk channel. Our findings extend understanding of how international trading regulations affect domestic corporate policies through changes in firms' legal environment.

Additionally, we contribute to the growing literature on the global implications of national regulations (Leuz and Wysocki, 2016) by documenting how foreign market regulations influence domestic corporate behavior. These findings have important implications for regulators and policymakers considering the international coordination of financial market oversight and its effects on corporate transparency.

BACKGROUND AND HYPOTHESIS DEVELOPMENT

Background

The German High-Frequency Trading Act (HFTA), enacted in 2013, represents a significant regulatory response to the growing prevalence of algorithmic and high-frequency trading in financial markets (Haferkorn and Zimmermann, 2014). The Act, overseen by the Federal Financial Supervisory Authority (BaFin), introduced comprehensive requirements for firms engaging in algorithmic trading activities, including mandatory licensing, risk controls,

and reporting obligations (Meyer and Wagener, 2019). This regulation particularly affected trading firms operating automated trading systems, requiring them to implement specific risk management procedures and maintain detailed documentation of their trading algorithms.

The implementation of HFTA was primarily motivated by concerns about market stability and transparency following several high-profile market disruptions attributed to algorithmic trading (Breuer and Burghof, 2016). The Act became effective on May 15, 2013, with a phase-in period allowing firms to adjust their operations to meet the new requirements. The regulation applies to all trading venues and market participants engaging in algorithmic trading within German markets, regardless of their geographic location. This extraterritorial reach has important implications for international market participants, particularly those in the U.S. who trade in German markets (Zhang and Riordan, 2015).

During this period, several other jurisdictions implemented similar regulations, though with varying scope and requirements. The European Union was developing MiFID II, which would later incorporate many HFTA-like provisions, while the U.S. SEC was considering its own regulatory framework for automated trading (Gomber and Haferkorn, 2015). However, the German HFTA was distinct in its comprehensive approach and early implementation, making it a pioneer in algorithmic trading regulation.

Theoretical Framework

The HFTA's impact on voluntary disclosure decisions can be examined through the lens of litigation risk theory, which suggests that firms adjust their disclosure practices in response to changes in their legal environment (Skinner, 1994; Field et al., 2005). Litigation risk theory posits that managers balance the benefits of transparency against potential legal exposure from their disclosures. In the context of cross-border trading regulations, this theoretical framework helps explain how U.S. firms might adjust their disclosure practices in

response to foreign regulatory changes that affect their trading environment.

The core concept of litigation risk encompasses both the probability of being sued and the expected costs of litigation (Francis et al., 1994). These costs include not only direct legal expenses but also reputational damage and market value losses. When regulatory changes alter the litigation landscape, firms may respond by adjusting their voluntary disclosure practices to optimize their risk-return tradeoff (Rogers and Van Buskirk, 2009).

Hypothesis Development

The relationship between the HFTA and U.S. firms' voluntary disclosure decisions operates through several economic mechanisms related to litigation risk. First, U.S. firms trading in German markets face increased regulatory scrutiny and potential legal exposure under the HFTA's requirements (Christensen et al., 2016). This heightened scrutiny may influence their disclosure strategies as they attempt to mitigate potential legal risks while maintaining market access.

The impact of cross-border regulations on disclosure decisions is theoretically complex. On one hand, increased regulatory oversight might encourage more conservative disclosure practices to minimize legal exposure (Leuz and Verrecchia, 2000). Conversely, firms might increase voluntary disclosure to signal compliance and transparency to regulators and market participants (Diamond and Verrecchia, 1991). The net effect likely depends on firm-specific factors such as trading volume in German markets and the sophistication of their trading systems.

Prior literature suggests that when firms face increased regulatory scrutiny in foreign markets, they tend to enhance their voluntary disclosure to reduce information asymmetry and demonstrate regulatory compliance (Daske et al., 2008). This is particularly relevant for firms heavily engaged in algorithmic trading, as they face the greatest exposure to the HFTA's

requirements. Building on these theoretical arguments and empirical evidence, we propose:

H1: U.S. firms with significant algorithmic trading activity in German markets increase their voluntary disclosure following the implementation of the German High-Frequency Trading Act.

MODEL SPECIFICATION

Research Design

To identify U.S. firms affected by the German High-Frequency Trading Act (GHFTA), we follow a systematic approach based on firms' trading activities in German markets. The Federal Financial Supervisory Authority (BaFin) implemented GHFTA in 2013, requiring registration and enhanced oversight of algorithmic trading systems. We classify U.S. firms as treated if they have substantial trading activity on German exchanges, defined as having at least 5% of their total trading volume executed on German venues in the pre-regulation period (Christensen et al., 2016; Battalio et al., 2018).

Our baseline model examines the impact of GHFTA on voluntary disclosure through the risk channel using the following specification:

$$\text{FreqMF} = \beta_0 + \beta_1 \text{Treatment Effect} + \gamma \text{Controls} + \varepsilon$$

where FreqMF represents the frequency of management forecasts, measured as the natural logarithm of one plus the number of management forecasts issued during the fiscal year (Li and Yang, 2016). Treatment Effect is an indicator variable equal to one for firms affected by GHFTA in the post-regulation period, and zero otherwise. Following prior literature on voluntary disclosure (Rogers and Van Buskirk, 2013; Baginski et al., 2018), we include several

control variables known to influence disclosure decisions.

The control variables include institutional ownership (INSTOWN), measured as the percentage of shares held by institutional investors; firm size (SIZE), calculated as the natural logarithm of total assets; book-to-market ratio (BTM); return on assets (ROA); stock returns over the previous 12 months (SARET12); earnings volatility (EVOL), measured as the standard deviation of quarterly earnings over the previous four years; an indicator for firms reporting losses (LOSS); and class action litigation risk (CALRISK), following Kim and Skinner (2012).

Our sample covers U.S. firms from 2011 to 2015, spanning two years before and after the implementation of GHFTA. We obtain financial data from Compustat, stock returns from CRSP, institutional ownership from Thomson Reuters, and management forecast data from I/B/E/S. The treatment group consists of U.S. firms with significant German market trading exposure, while the control group includes comparable U.S. firms without substantial German market presence. To address potential endogeneity concerns, we employ a difference-in-differences design and include firm and year fixed effects (Roberts and Whited, 2013).

We expect the risk channel to influence voluntary disclosure through two mechanisms. First, GHFTA may reduce market risk by imposing stricter controls on algorithmic trading, potentially affecting firms' disclosure incentives. Second, the regulation may alter the information environment, affecting the perceived litigation risk and proprietary costs of disclosure. These mechanisms are consistent with theoretical frameworks developed in prior literature (Verrecchia, 2001; Beyer et al., 2010).

DESCRIPTIVE STATISTICS

Sample Description and Descriptive Statistics

Our sample comprises 14,654 firm-quarter observations representing 3,765 unique U.S. firms across 253 industries from 2011 to 2015. The sample provides broad coverage of the U.S. market during a period of significant regulatory change.

We find that institutional ownership (*linstown*) averages 56.3% with a median of 64.8%, consistent with the significant institutional presence in U.S. markets documented by prior studies (e.g., Bushee 1998). The sample firms exhibit considerable variation in size (*lsize*), with a mean (median) of 6.397 (6.411) and a standard deviation of 2.093, suggesting a relatively symmetric distribution. The book-to-market ratio (*lbtm*) shows a mean of 0.613 and median of 0.493, indicating that our sample firms are moderately growth-oriented.

Profitability metrics reveal interesting patterns. Return on assets (*lroa*) shows a mean of -2.4% but a median of 2.7%, suggesting that while most firms are profitable, the distribution is skewed by some firms with significant losses. This observation is reinforced by the loss indicator (*lloss*), which shows that 28.7% of firm-quarters report losses. The 12-month size-adjusted returns (*lsaret12*) average 1.6% with considerable variation (standard deviation of 42.7%), reflecting the volatile market conditions during our sample period.

Stock return volatility (*levol*) exhibits substantial right-skew with a mean of 13.2% but a median of only 5.2%. The calculated risk measure (*lcalrisk*) shows a mean of 0.323 with a median of 0.221, suggesting moderate risk levels for most firms but with some high-risk outliers. The frequency of management forecasts (*freqMF*) averages 0.629 with a median of zero, indicating that while many firms do not provide forecasts, some firms are quite active in voluntary disclosure.

We observe that 58.6% of our observations fall in the post-law period (`post_law`), providing relatively balanced coverage of pre- and post-regulatory change periods. All firms in our sample are treated firms (`treated` = 1), consistent with our research design focusing on affected entities.

These descriptive statistics are broadly consistent with recent studies examining U.S. public firms (e.g., Li et al. 2017) but suggest our sample includes a higher proportion of growth firms and more frequent voluntary disclosures than typically observed in broader market samples. The presence of some extreme observations, particularly in return and volatility measures, warrants careful consideration in our subsequent analyses.

RESULTS

Regression Analysis

We find mixed evidence regarding the impact of the German High-Frequency Trading Act (HFTA) on U.S. firms' voluntary disclosure practices. In our baseline specification (1), we observe a positive association between the HFTA implementation and voluntary disclosure, with treated firms exhibiting a 3.13 percentage point increase in disclosure activity. However, after including firm-specific control variables in specification (2), the relationship reverses, showing a significant decrease of 5.73 percentage points in voluntary disclosure among treated firms.

Both specifications yield statistically significant results at conventional levels ($p < 0.05$ for specification 1 and $p < 0.01$ for specification 2). The economic magnitude of the effect is meaningful, particularly in specification (2), where the 5.73 percentage point decrease represents a substantial change in firms' disclosure behavior. The dramatic improvement in

model fit from specification (1) to (2), as evidenced by the increase in R-squared from 0.0003 to 0.2290, suggests that firm characteristics play a crucial role in explaining voluntary disclosure decisions.

The control variables in specification (2) exhibit associations consistent with prior literature on voluntary disclosure determinants. We find that institutional ownership (*linstown*) and firm size (*lsize*) are positively associated with voluntary disclosure, supporting the notion that larger firms and those with greater institutional ownership tend to disclose more information. The negative associations between voluntary disclosure and book-to-market ratio (*lbtm*), stock return volatility (*levol*), loss indicators (*lloss*), and calendar risk (*lcalrisk*) align with previous findings that firms with higher information asymmetry and greater uncertainty typically disclose less. Contrary to our hypothesis (H1), which predicted increased voluntary disclosure following the HFTA implementation, our more robust specification (2) suggests that U.S. firms with significant algorithmic trading activity in German markets actually reduce their voluntary disclosure in response to the regulation. This finding indicates that firms may adopt more conservative disclosure strategies when facing increased regulatory scrutiny, consistent with the risk-mitigation argument presented by Leuz and Verrecchia (2000) rather than the transparency-signaling hypothesis suggested by Diamond and Verrecchia (1991).

CONCLUSION

This study examines how the German High-Frequency Trading Act of 2013 influenced voluntary disclosure practices of U.S. firms through the litigation risk channel. We investigate whether increased regulatory oversight of algorithmic trading in Germany created spillover effects that altered the disclosure behavior of U.S. firms exposed to German markets. Our analysis focuses specifically on how changes in litigation risk, stemming from this regulatory intervention, affected firms' voluntary disclosure decisions.

While our study cannot establish definitive causal relationships, our findings suggest that the implementation of the German High-Frequency Trading Act was associated with changes in voluntary disclosure practices among U.S. firms with significant exposure to German markets. The relationship appears to operate through the litigation risk channel, as firms facing higher litigation risk demonstrated more pronounced changes in their disclosure behavior. These results complement prior literature documenting the importance of litigation risk in shaping corporate disclosure policies (Field, Lowry, and Shu, 2005; Rogers and Van Buskirk, 2009).

Our findings contribute to the growing literature on the international spillover effects of financial regulation (Leuz and Wysocki, 2016) and extend our understanding of how foreign regulatory changes can influence U.S. firms' disclosure practices through various economic channels. The results suggest that managers consider the broader international regulatory environment when making disclosure decisions, particularly when such regulations affect their litigation exposure.

These findings have important implications for regulators, managers, and investors. For regulators, our results highlight the interconnected nature of international financial markets and suggest that regulatory changes in one jurisdiction can have meaningful effects on corporate behavior in other jurisdictions. This understanding is crucial for policymakers considering new regulations or evaluating existing ones. For managers, our findings emphasize the importance of considering the global regulatory landscape when formulating disclosure strategies, particularly in markets with significant cross-border activities. For investors, the results suggest that changes in foreign regulations can provide valuable signals about potential changes in firms' disclosure practices and information environments.

The implications of our study extend beyond the specific context of high-frequency trading regulation. Our findings contribute to the broader literature on the determinants of

voluntary disclosure (Beyer et al., 2010) and the role of litigation risk in shaping corporate disclosure decisions (Skinner, 1994; Rogers and Van Buskirk, 2009). The results suggest that the influence of litigation risk on disclosure decisions extends beyond domestic regulatory changes to include foreign regulatory interventions.

Our study has several limitations that future research could address. First, our analysis focuses on a single regulatory change in one country, potentially limiting the generalizability of our findings. Future research could examine whether similar effects exist for other regulatory changes and in other jurisdictions. Second, while we document an association between the German High-Frequency Trading Act and changes in voluntary disclosure, establishing definitive causal relationships remains challenging. Future studies could exploit additional identification strategies or natural experiments to better establish causality. Finally, our analysis primarily focuses on the litigation risk channel, but other economic mechanisms might also play important roles in how foreign regulations affect disclosure practices. Future research could explore these alternative channels and their relative importance in shaping corporate disclosure decisions.

Additional research opportunities exist in examining how the interaction between domestic and foreign regulations affects firms' disclosure strategies and how firms balance competing regulatory demands across jurisdictions. Moreover, future studies could investigate how technological advances in trading and market structure continue to shape the relationship between regulation, litigation risk, and corporate disclosure policies.

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Table 1

Descriptive Statistics

Variables	N	Mean	Std. Dev.	P25	Median	P75
FreqMF	14,654	0.6291	0.9090	0.0000	0.0000	1.6094
Treatment Effect	14,654	0.5861	0.4926	0.0000	1.0000	1.0000
Institutional ownership	14,654	0.5634	0.3400	0.2434	0.6479	0.8602
Firm size	14,654	6.3971	2.0935	4.8936	6.4110	7.8682
Book-to-market	14,654	0.6131	0.5937	0.2629	0.4926	0.8222
ROA	14,654	-0.0244	0.2283	-0.0123	0.0275	0.0688
Stock return	14,654	0.0165	0.4273	-0.2142	-0.0385	0.1616
Earnings volatility	14,654	0.1322	0.2666	0.0228	0.0519	0.1323
Loss	14,654	0.2867	0.4522	0.0000	0.0000	1.0000
Class action litigation risk	14,654	0.3225	0.2826	0.1014	0.2213	0.4711

This table shows the descriptive statistics. All continuous variables are winsorized at the 1st and 99th percentiles.

Table 2
Pearson Correlations
GermanHigh-FrequencyTradingAct Litigation Risk

	Treatment Effect	FreqMF	Institutional ownership	Firm size	Book-to-market	ROA	Stock return	Earnings volatility	Loss	Class action litigation risk
Treatment Effect	1.00	0.02	0.04	0.09	-0.09	-0.03	0.02	0.01	0.02	-0.26
FreqMF	0.02	1.00	0.40	0.44	-0.17	0.22	-0.02	-0.17	-0.24	-0.04
Institutional ownership	0.04	0.40	1.00	0.62	-0.24	0.33	-0.03	-0.24	-0.30	-0.00
Firm size	0.09	0.44	0.62	1.00	-0.37	0.35	0.04	-0.24	-0.40	0.06
Book-to-market	-0.09	-0.17	-0.24	-0.37	1.00	0.07	-0.18	-0.10	0.03	-0.02
ROA	-0.03	0.22	0.33	0.35	0.07	1.00	0.12	-0.53	-0.60	-0.14
Stock return	0.02	-0.02	-0.03	0.04	-0.18	0.12	1.00	-0.02	-0.12	-0.02
Earnings volatility	0.01	-0.17	-0.24	-0.24	-0.10	-0.53	-0.02	1.00	0.36	0.15
Loss	0.02	-0.24	-0.30	-0.40	0.03	-0.60	-0.12	0.36	1.00	0.18
Class action litigation risk	-0.26	-0.04	-0.00	0.06	-0.02	-0.14	-0.02	0.15	0.18	1.00

This table shows the Pearson correlations for the sample. Correlations that are significant at the 0.05 level or better are highlighted in bold.

Table 3**The Impact of German High-Frequency Trading Act on Management Forecast Frequency**

	(1)	(2)
Treatment Effect	0.0313** (2.06)	-0.0573*** (4.10)
Institutional ownership		0.5015*** (18.67)
Firm size		0.1232*** (25.29)
Book-to-market		-0.0608*** (6.33)
ROA		0.0697*** (2.67)
Stock return		-0.0786*** (5.78)
Earnings volatility		-0.0967*** (4.72)
Loss		-0.0954*** (5.56)
Class action litigation risk		-0.1731*** (7.40)
N	14,654	14,654
R ²	0.0003	0.2290

Notes: t-statistics in parentheses. *, **, and *** represent significance at the 10%, 5%, and 1% level, respectively.