The UK financial firms' textual risk disclosure and market liquidity*

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Abstract

The informativeness of textual risk disclosure (TRD) of financial firms is unexplored in the extant literature. Employing a sample of UK FTSE all-share financial firms, this paper fills this gap in the literature by providing the first empirical evidence on the relationship between TRD and market liquidity. Consistent with the convergence argument for TRD, we find that TRD decreases the financial firms' market liquidity. However, consistent with the divergence argument for TRD, our further analysis shows that TRD increases the market liquidity of *large* financial firms. Overall, our results suggest that financial firms' TRD is informative to market participants. In addition to the practical and policy implications of our results, this paper opens avenues for future research to use our textual method to measure the determinants and use risk information of financial firms in different contexts.

Keywords: Automated textual analysis; Risk disclosure; Market liquidity; Financial firms

1. Introduction

This paper investigates whether risk information revealed in the narrative sections of UK financial firms' annual reports is informative. Addressing this question is vital not only because it is still open in the extant literature (Elshandidy et al., 2018), but also as investors rely on risk information in analyzing and pricing risks in capital valuation and allocation, thereby contributing to their ability to make investment decisions (Elsayed et al., 2023). Nevertheless, the extant evidence on the informativeness of risk disclosure is limited to non-financial firms and reached inconclusive evidence (Elshandidy et al., 2018). Therefore, using a sample of the UK FTSE all-share financial firms, this paper addresses this unexplored research question by examining the relationship between TRD and market liquidity.

As an unexplored research area, we put forth our expectations in a fashion consistent with Kravet and Muslu's (2013) three arguments for the informativeness of TRD. The first (*null*) argument is that risk disclosure will not have an observable economic effect on market liquidity because such disclosure is generic or boilerplate. The second (*divergence*) argument is that risk disclosure will improve market liquidity since such revealed risk information is likely to be firm-specific and because investors are likely to incorporate it into their decisions on prices the market is likely to economically react to it. The third (*convergence*) argument holds that risk disclosure will decline market liquidity since such information resolves a company's known risk factors.

The paper examines market liquidity because it has a strong theoretical association with disclosure (e.g., Diamond & Verrecchia, 1991). Bid-ask spread (spread) and share turnover (turnover) are well-established measures of market liquidity and have long been considered proxies for information asymmetry and risk perceptions (e.g., Leuz & Wysocki, 2016). As in Kravet and Muslu's (2013) three arguments, TRD can increase or decrease market liquidity because it tends to affect information asymmetry and risk perceptions. To elaborate briefly, spread addresses the adverse selection problem that arises from transacting in firm shares in the presence of risk perceptions and/or asymmetrically informed investors. Less (more) adverse selection, in turn,

2

implies a smaller (larger) bid-ask spread, i.e., higher (lower) market liquidity. Turnover indicates adverse selection but differently as it measures market liquidity by capturing the willingness of some investors who hold firm shares to sell and the willingness of others to buy. This willingness to transact in firm shares (i.e., higher trading volume and thus higher market liquidity) should be inversely related to the existence of information asymmetries and risk perceptions (e.g., Leuz & Verrecchia, 2000; Garfinkel, 2009). Thus, spread (turnover) is negatively (positively) associated with market liquidity.

Our motive to examine UK FTSE all-share financial firms stems from several reasons: (1) to boost our study's practical and policy implications given that the related regulations are not only restricted to relevant International Financial Reporting Standard (e.g., IFRS 7 & 9), but also covers regulations issued by the Basel Committee on Banking Supervision (e.g., BCBS 2010), (2) to address concerns relating to the informativeness of risk disclosure practices to achieve and maintain capital market trust and confidence, particularly amid the recent financial sector instabilities, e.g., BCBS 2015) (3) financial firms are risk-orientated entities and they have different risks as compared to non-financial firms (BCBS, 2006), and (4) despite the sizeable growing body of literature on risk disclosure (see literature review by Elshandidy et al., 2018), very little is known about the nature of risk disclosure by financial firms generally, and within the UK particularly.

The extant literature on financial firms mainly revolves around manually constructing an index to capture one type of risk disclosure (operational risk (Barakat & Hussainey, 2013); market risk (Al-Hadi et al., 2019); risk management (Elamer et al., 2019)) to examine the underlying incentives for managers to reveal risk information. To date, there is no empirical evidence on whether TRD provided by UK financial firms is informative to the market participants. Thus, our paper advances the prior research by using automated textual content analysis to examine the informativeness of TRD, and, thus, respond to the call by Elshandidy et al.'s (2018) review paper.

Our findings show that TRD decreases the financial firms' market liquidity consistent with the divergence argument. Our further analysis, however, shows that *large* financial firms' TRD

increases the market liquidity consistent with the convergence argument. Our results are robust to possible endogeneity concerns. Collectively, our findings suggest that financial firms' TRD is informative to market participants.

Our paper has important contributions and implications as follows. It is the first to examine the informativeness of TRD by the UK FTSE-all share financial firms. Our work advances the existing literature that largely concerns non-financial firms (e.g., Elshandidy et al., 2016). We conduct our analyses on the largest sample of financial firms within the UK, which benefits the empirical analyses. Our findings add to the debate by academics (Elshandidy et al., 2018) and professional bodies (ICAEW 2011) over the last two decades on the usefulness of TRD. Finally, we provide a way forward for other researchers to use our textual method presented in Appendix B to measure the determinants and use risk information of financial firms in different contexts.

2. Relevant literature and hypothesis development

Theoretical research argues that risk disclosures can potentially increase or decrease market liquidity by enhancing or worsening information asymmetries and risk perceptions (Diamond & Verrecchia 1991; Kim & Verrecchia 1994). In this regard, spread and turnover are commonly considered to explicitly measure market liquidity due to the adverse selection problem that arises from transacting in firm shares in the presence of asymmetrically informed investors and investors risk perceptions (e.g., Leuz & Verrecchia; Garfinkel, 2009). Previous research suggests that the spread increases and turnover decreases when investors perceive a firm to face more risk because informed investors may have information advantage (e.g., Jayaraman, 2008).

Thus, on the one hand, by conveying risk information that does not change the investors' expectations of the firm's cash flows (*convergence argument*), investors' confidence will decrease resulting in lower market liquidity (e.g., Barron et al., 2002). On the other hand, investors are likely to change their expectations (*divergent argument*), if risk disclosure reveals new content that reduces information asymmetries among informed and uninformed investors by updating a firm's risk

4

aspects. That is being so, investors can be relatively confident that transactions occur at a fair price, which, in turn, increases market liquidity (Healy & Palepu, 2001). This discussion leads to the following unidirectional hypothesis:

H1: *Ceteris paribus*, TRD affects financial firms' market liquidity.

3. Method

3.1 Sample selection

Our paper employs a sample of the UK FTSE all-share financial firms. Financial firms are classified according to the Industry Classification Benchmark [ICB] adopted by London Stock Exchange, and obtained from Refinitiv Eikon database. Financial firms are generally homogenous in the factors that are likely to affect TRD (Akhigbe & Martin, 2008; Sibindi & Makina, 2018; Farag & Dickinson, 2020). The sample period starts in 2005, when it became mandatory for all UK firms to adopt IFRS, and ends in 2018, to avoid results bias (measurement error endogeneity bias) due to major confounding events in the UK during the Brexit chaos and coronavirus crisis. This also helps because the labor work exerted to manually collect the financial firms' annual reports to retrieve TRD data is substantially time and effort-consuming. The final sample, after excluding all missing observations, comprises 1,800 firm-year observations.

3.2 Empirical model

We use the following OLS regression to test the impact of the TRD on market liquidity:

$$Liquidity_{it+1} = B_o + B_1\, TRD_{it} + \sum_{j=1}^{nj} \delta_j\, Control\ Variables_{jit} + \varepsilon_{it} \qquad (1),$$

where the dependent variable is market liquidity (Liquidity) for firm *i* at time *t+1,* in separate tests, is measured by bid-ask spread (Spread) and share turnover (Turnover). Consistent with our discussion in Section 1, Spread is a negative indicator of market liquidity, i.e., the larger (smaller) Spread the lower (higher) market liquidity. Also, Turnover is a positive indicator of market liquidity, i.e., the larger (smaller) Turnover the higher (lower) market liquidity. TRD is our key independent variable, measured as the percentage of words indicating risk in the annual report narrative sections,

where automated textual analysis is processed using Diction 7 software employing the risk wordlist presented in Appendix B. Consistent with prior literature (e.g., Leuz & Verrecchia, 2000; Kanagaretnam et al., 2007; Campbell et al., 2014; Barakat et al., 2014; Elshandidy & Neri, 2015), we control for firm size, leverage, growth, profitability, trading volume, beta, stock volatility, board independence, and dividend policy. Predicted signs are given in our table of results. All independent and control variables are measured at fiscal year-end t. Detailed variable definitions and measures are provided in Appendix A. Standard error are corrected for heteroskedastic bias. All continuous variables are winsorized at the 1st and 99th percentiles. VIFs are less than 10 in our regressions thereby multicollinearity is not a concern.

4. Results

Columns 1 and 2 of Table 1 report summary statistics of variables employed in our analyses. On average, risk information represents about 2% of narrative content. In addition, the average mean of the relative percentage of spread and share turnover ratio are 1.129 and 0.2%, respectively. Across regression estimates for the effect of TRD on market liquidity, as in columns 3 and 4 of Table 1, results show positively significant association with Spread (t-statistic = 6.217 at the 1% level) and negatively significant association with Turnover (t-statistic = -3.291 at the 1% level). These findings support Kravet and Muslu's (2013) divergence argument and suggest that TRD by financial firms decreases market liquidity as the company's revealed risk information is likely to increase risk perceptions and information asymmetry.

[Table 1 here]

Next, we examine Kravet and Muslu's (2013) convergence argument by focusing on *large* financial firms placed in the upper quartile of our sample. According to Kravet and Muslu (2013), TRD will increase market liquidity if resolves a firm's known risk factors and thus decrease risk perceptions and information asymmetry. Large firms typically have a rich information environment which would make their risk factors known to market participants (e.g., Gupta et al., 2018). Therefore, consistent with Kravet and Muslu's (2013) convergence argument, we would

expect improvement in market liquidity of large financial firms following TRD. Supporting this, across regression estimates for the effect of large (vs small) financial firms' TRD on market liquidity, as in columns 1 and 3 of Table 2, results show negatively significant association with Spread (*t*-statistic = -3.516 at the 1% level) and positively significant association with Turnover (*t*-statistic = 3.307 at the 1% level). These findings support Kravet and Muslu's (2013) convergence argument and suggest that TRD by large financial firms increases market liquidity as it resolves firm's known risk factors and thus decreases risk perceptions and information asymmetry.

[Table 2 here]

In Table 3, consistent with prior research, we address possible endogeneity concerns using various powerful econometric techniques. In column 1 of Table 3, we employ a firm-fixed effects regression to address the omitted variable concern and to control for unobserved heterogeneity of a firm-specific and/or time-invariant nature (Mekhaimer et al., 2022). In column 2 of Table 3, we address the possible simultaneity problem by using lagged independent variables, which technically works as a dynamic generalized method of moments estimation (Zalata & Abdelfattah, 2021). In column 3 of Table 3, following prior research (e.g., Goktan et al., 2018; Ashbaugh-Skaife et al., 2006), we employ a two-stage least squares (2SLS) statistical approach as a further test to account for possible endogeneity, wherein the financial firms yearly-median-adjusted (exogenous) TRD$_{IV}$ is instrumentalized in the first stage to estimate the predicted values of our explanatory variable in the second stage. It is exogenous as it is unlikely to find association with firm-level disturbances in stock prices while considering the industry level, which is also jointly supported by its high statistical significance and F-statistics (e.g., Kini & Williams, 2012). Firms may hide or release (more) risk news especially when outsiders are uncertain whether a firm is endowed with private information (Dye, 1985; Jung & Kwon, 1988). Nevertheless, to the extent that market participants can learn from peer firm disclosures about the information endowment of managers (Dye & Sridhar, 1995), the resulting decreased uncertainty would provoke risk disclosure of the firm, resulting in more risk disclosure. Supporting this, Seo (2021) documents that a firm's voluntary

disclosure is shaped by the disclosures made by its industry peers; thus, satisfying the relevance condition. Furthermore, in column 4 of Table 3, we also employ a change analysis technique to mitigate endogeneity concerns, wherein we define changes as the differences between a firm's observed value and the median value for other financial firms over the years of study (Kravet & Muslu, 2013; Elshandidy & Shrives, 2016). Collectively, these sensitivity tests show results that are qualitatively similar to our main findings and, thus, our inferences are robust and not subject to possible endogeneity problems.[1]

[Table 3 here]

5. Conclusion

This paper provides novel evidence-based insights on the informativeness of financial firms' TRD, which still is unexplored in the extant literature. Employing a sample of UK FTSE all-share financial firms, this paper fills this gap in the literature by providing the first empirical evidence on the relationship between TRD and market liquidity. Consistent with the convergence argument for TRD, we find that TRD decreases the financial firms' market liquidity. However, consistent with the divergence argument for TRD, our further analysis shows that TRD increases the market liquidity of *large* financial firms. Overall, our results suggest that financial firms' TRD is informative to market participants. The empirical insights provided by our paper should be of interest to the International Accounting Standards Board (IASB) to assess structural reforms including IFRS 9 that complements the previous IFRS 7, as well as IAS 32 and 39 along with the Basel Accords (I, II, and III) as a way of improving the extent to which risk is managed, measured and disclosed. In addition to the practical and policy implications of our results, this paper opens avenues for future research to use our textual method presented in Appendix B to measure the determinants and use risk information of financial firms in different contexts.

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[1] The coefficient on TRD in the turnover firm-fixed effects test results was slightly trivial but constantly show negative sign on TRD (t-statistic is -1.582) potentially effect size because of considerable magnitude of the confidence intervals (Burke et al., 2023).

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Table 1. Regressions results for the impact of financial firm's TRD on market liquidity

Variables	Descriptive statistics		Dependent variable (DV): *Market liquidity*					
	Mean	Std. dev.	*Spread*			*Turnover*		
	(1)	(2)	(3)			(4)		
			ES	Coef.	*t*-stat.	ES	Coef.	*t*-stat.
TRD	2.016	0.340	(?)	**0.459*****	6.217	(?)	**-0.043*****	-3.291
Spread	1.129	1.083						
Turnover	0.002	0.002						
Size	13.608	2.163	(-)	-0.324***	-22.646	(+)	0.027***	10.858
Leverage	0.531	1.387	(-)	0.000	1.602	(+)	0.000**	2.301
Growth	1.267	1.130	(-)	-0.029	-1.080	(+)	0.010**	2.163
Profitability	8.331	16.595	(-)	-0.004**	-2.141	(+)	0.001**	2.554
Volume	0.281	0.547	(-)	-0.155***	-5.411	(+)	0.101***	5.117
Beta	0.943	0.406	(-)	-0.281***	-3.491	(+)	-0.038**	-2.143
Volatility	0.258	0.128	(+)	1.429***	4.657	(+)	0.275***	4.286
Independence	0.792	0.222	(-)	-0.625***	-4.492	(+)	0.045**	2.083
Dividends	2.543	2.073	(?)	0.032***	2.691	(?)	0.004*	1.741
Intercept			(?)	5.146***	19.130	(?)	-0.249***	-6.085
Year-fixed effects				Yes			Yes	
Adj. R-squared				0.416			0.387	
F-statistics				46.24***			24.88***	
Maximum VIF				2.78			2.74	
Observations				1,800			1,800	

This table presents the descriptive statistics (columns 1 and 2) and OLS regression estimates of the association between TRD by UK FTSE all-share financial firms and market liquidity as proxied by bid-ask spread (column 3) and share turnover (column 4). All continuous variables are winsorized at the 1st and 99th percentiles. *T*-statistics are corrected for heteroskedastic bias and provided in separate columns next to the coefficient columns. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. Variable definitions, measures, and sources are provided in Appendix A.

Table 2. Cross-sectional regression results for the impact of large vs small financial firm's TRD on market liquidity

Panel A: OLS regression results

Variables		Dependent variable (DV): *Market liquidity*								
		Spread				*Turnover*				
		(1) Large firms		(2) Small firms			(3) Large firms		(4) Small firms	
	ES	Coef.	*t*-stat.	Coef.	*t*-stat.	ES	Coef.	*t*-stat.	Coef.	*t*-stat.
TRD	(-)	**-0.181*** **	-3.516	0.312	1.168	(+)	**0.032*** **	3.307	-0.016	-1.635
Leverage	(-)	-0.019	-1.397	0.481	0.929	(+)	-0.000	-1.194	-0.001	-1.503
Growth	(-)	-0.031	-1.322	-0.061	-0.682	(+)	-0.000	-0.070	0.005	0.729
Profitability	(-)	-0.004	-1.556	0.001	0.300	(+)	0.000	0.611	-0.000*	-1.664
Volume	(-)	-0.335***	-3.830	-0.167**	-2.291	(+)	0.428***	6.149	0.031	1.357
Beta	(-)	-0.520***	-4.472	-0.951***	-2.894	(+)	-0.015	-0.608	-0.069**	-2.076
Volatility	(+)	1.240**	2.492	4.370***	2.689	(+)	0.327***	3.475	0.472***	3.352
Independence	(-)	-0.467***	-2.827	-1.117***	-3.068	(+)	0.044	1.156	0.091***	3.809
Dividends	(?)	0.037	1.623	-0.004	-0.128	(?)	0.014***	3.034	0.003	0.779
Intercept	(?)	1.314***	4.912	2.271***	2.944	(?)	-0.209***	-2.673	0.059	0.862
Year-fixed effects		Yes		Yes			Yes			
Adj. R-squared		0.249		0.242			0.260		0.181	
F-statistics		6.64***		5.43***			19.13***		4.10***	
Maximum VIF		2		2.95			3.18		2.74	
Observations		506		354			454		321	

Variables		**Panel B**: Firm-fixed effects regression results								
		Dependent variable (DV): *Market liquidity*								
		Spread				*Turnover*				
		(1) Large firms		(2) Small firms			(3) Large firms		(4) Small firms	
	ES	Coef.	*z*-stat.	Coef.	*z*-stat.	ES	Coef.	*z*-stat.	Coef.	*z*-stat.
TRD	(-)	**-0.102** **	(-2.264)	-0.004	(-0.028)	(+)	**0.044*** **	(3.252)	-0.008	(-0.631)
Leverage	(-)	0.000	(0.103)	0.006	(0.652)	(+)	-0.000**	(-2.553)	-0.000	(-0.522)
Growth	(-)	-0.069**	(-2.233)	-0.188*	(-1.733)	(+)	-0.000	(-0.015)	0.000	(0.039)
Profitability	(-)	-0.002	(-1.438)	0.003	(0.905)	(+)	0.000	(0.098)	-0.000	(-0.077)
Volume	(-)	-0.207***	(-3.036)	-0.226	(-0.962)	(+)	0.328***	(12.156)	0.172***	(8.325)
Beta	(-)	-0.144**	(-2.254)	0.309	(0.849)	(+)	-0.009	(-0.457)	-0.086***	(-2.647)
Volatility	(+)	0.004	(0.017)	0.330	(0.191)	(+)	0.299***	(3.805)	0.207	(1.361)
Independence	(-)	-0.234	(-0.914)	-0.229	(-0.302)	(+)	0.144*	(1.797)	0.010	(0.145)
Dividends	(?)	0.013	(0.950)	0.025	(0.406)	(?)	0.023***	(5.024)	0.008	(1.491)
Intercept	(?)	1.115	(1.094)	10.972***	(3.597)	(?)	-0.947***	(-2.994)	0.325	(1.205)
Year-fixed effects		Yes		Yes			Yes		Yes	
Firm-fixed effects		Yes		Yes			Yes		Yes	
R-squared		0.359		0.355			0.674		0.366	
F-statistics		6.64***		5.43***			19.13***		4.10***	
Observations		506		354			454		321	

Panel A (B) of this table presents the cross-sectional OLS (firm-fixed effect) regression estimates of the association between TRD by UK FTSE all-share *large vs small* financial firms and market liquidity as proxied by bid-ask spread (columns 1 and 2) and share turnover (columns 3 and 4). Large (small) financial firms have been identified as firms that are in the fourth (first) quartile. All continuous variables are winsorized at the 1st and 99th percentiles. *T*-statistics are corrected for heteroskedastic bias and provided in separate columns next to the coefficient columns. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. Variable definitions, measures, and sources are provided in Appendix A.

Table 3. Addressing possible endogeneity concerns

Variables		Panel A: Dependent variable (DV): *Market liquidity: Spread*							
		Fixed effect		Lagged variables		2SLS second stage		Change analysis	
		(1)		(2)		(3)		(4)	
	ES	Coef.	*z*-stat.	Coef.	*t*-stat.	Coef.	*t*-stat.	Coef.	*t*-stat.
TRD	(?)	**0.223****	2.544	**0.232*****	3.700	**2.512*****	(4.889)	**0.454*****	6.168
Size	(-)	-0.231***	-4.827	-0.311***	-21.670	-0.532***	(-11.049)	-0.323***	-22.684
Leverage	(-)	-0.000	-0.220	0.000*	1.886	0.000	(0.737)	0.000	1.530
Growth	(-)	-0.052	-1.323	-0.051**	-1.993	0.100***	(2.592)	-0.028	-1.074
Profitability	(-)	-0.005***	-3.556	-0.003**	-2.066	-0.005***	(-2.914)	-0.004**	-2.150
Volume	(-)	-0.220***	-3.743	-0.153***	-5.264	-0.005	(-0.095)	-0.155***	-5.410
Beta	(-)	0.003	0.039	-0.263***	-3.148	-0.143	(-1.615)	-0.281***	-3.487
Volatility	(+)	0.749**	2.484	1.324***	4.212	0.988***	(3.463)	1.429***	4.655
Independence	(-)	-0.078	-0.344	-0.621***	-4.322	-1.537***	(-7.499)	-0.623***	-4.480
Dividends	(?)	0.011	0.692	0.032***	2.629	0.019	(1.566)	0.032***	2.684
Intercept	(?)	3.704***	5.113	5.169***	19.470	4.266***	(10.027)	5.783***	20.931
Year-fixed effects		Yes		Yes		Yes		Yes	
Firm-fixed effects		Yes		No		No		No	
Adj. R-squared		0.280		0.425		0.144		0.416	
F-stat./ Wald Chi2		27.54***		41.84***		67.23***		46.19***	
Maximum VIF		2.78		2.81		2.78		2.78	
Observations		1,800		1,665		1,800		1,800	

Variables		Panel B: Dependent variable (DV): *Market liquidity: Turnover*							
		Fixed effect		Lagged variables		2SLS second stage		Change analysis	
		(1)		(2)		(3)		(4)	
	ES	Coef.	*z*-stat.	Coef.	*t*-stat.	Coef.	*t*-stat.	Coef.	*t*-stat.
TRD	(?)	-0.021	(-1.582)	**-0.022****	(-2.140)	**-0.381*****	(-4.013)	**-0.042*****	(-3.265)
Size	(-)	-0.016**	(-2.197)	0.025***	(10.079)	-0.015	(-1.594)	0.027***	(10.811)
Leverage	(-)	0.000***	(3.319)	0.000**	(2.206)	0.000**	(2.275)	0.000**	(2.307)
Growth	(-)	-0.007	(-1.080)	0.008*	(1.869)	0.036***	(5.036)	0.010**	(2.163)
Profitability	(-)	0.001**	(2.508)	0.001***	(2.607)	0.001**	(2.144)	0.001**	(2.562)
Volume	(-)	0.183***	(19.332)	0.099***	(4.845)	0.126***	(13.503)	0.101***	(5.116)
Beta	(-)	-0.001	((-0.057)	-0.037**	(-1.968)	-0.013	(-0.778)	-0.038**	(-2.143)
Volatility	(+)	0.105**	(2.285)	0.259***	(3.710)	0.153***	(2.809)	0.275***	(4.283)
Independence	(-)	0.014	(0.406)	0.041*	(1.782)	-0.135***	(-3.382)	0.045**	(2.066)
Dividends	(?)	0.008***	(3.301)	0.004*	(1.820)	-0.000	(-0.082)	0.003	(1.557)
Intercept	(?)	0.299***	(2.816)	-0.258***	(-6.122)	-0.413***	(-5.454)	-0.336***	(-7.668)
Year-fixed effects		Yes		Yes		Yes		Yes	
Firm-fixed effects		Yes		No		No		No	
Adj. R-squared		0.398		0.373		0.446		0.387	
F-stat./Wald Chi2		42.43***		21.98***		59.19***		24.93***	
Maximum VIF		2.78		2.77		3.78		2.74	
Observations		1,629		1,510		1,800		1,629	

Panels A and B of this table presents tests used to account for possible endogeneity concerns using econometric techniques on the title of columns 1 through 4. All continuous variables are winsorized at the 1st and 99th percentiles. *T(Z)*-statistics are corrected for heteroskedastic bias and provided in separate columns next to the coefficient columns. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. Variable definitions, measures, and sources are provided in Appendix A.

Appendix A. Variable definitions

Variable	Definitions, measures, and sources
Liquidity	Market liquidity of a financial firm's daily data over the three months after the release of annual reports to ensure that the information is publicly available to investors and allowing sufficient time to take into their investment decisions. It is measured by two measures using Refinitiv Eikon: The first is the mean of the relative percentage of spread (Spread), calculated by dividing the difference between the daily ask and bid prices by the average of the daily ask and bid prices, as per the following equation: $$\text{Bid} - \text{Ask Spread} = \frac{1}{\text{Days}} \sum_{d=1}^{\text{Days}} \frac{\text{Ask} - \text{Bid}}{\frac{\text{Ask} + \text{Bid}}{2}}$$ The second is share turnover ratio (Turnover), calculated by dividing the trading volume by the number of outstanding shares, as per the following equation: $$\text{Share turnover} = \frac{\text{Trading volume}}{\text{Number of outstanding shares}}$$
TRD	The frequencies of risk-related words scaled by the total word count of the annual report, using Diction 7 automated textual analysis software and risk wordlist given in Appendix B. Source: Annual reports.
Size	Natural log of total assets. Source: Refinitiv Eikon.
Leverage	Debt-to-equity ratio, calculated by dividing total debt by common Equity. Source: Refinitiv Eikon.
Growth	Market to book value ratio. Source: Refinitiv Eikon.
Profitability	Net income before preferred dividends divided by the year-end common equity. Source: Refinitiv Eikon.
Volume	Daily trading volume divided by the number of outstanding shares. Source: Refinitiv Eikon.
Beta	Covariance of a financial firm's market return relative to a market index. Source: Refinitiv Eikon.
Volatility	Standard deviation of daily stock prices. Source: Refinitiv Eikon.
Independence	Proportion of independent non-executive directors on the board. Source: Refinitiv Eikon.
Dividends	Dividend per share for the most recent full year divided by the current share price. Source: Refinitiv Eikon.

Appendix B. TRD method

This paper creates a comprehensive list of risk-related keywords to capture TRD in financial firms annual report narratives. Consistent with prior textual content analysis research in accounting and finance (for a review, see Loughran & McDonald, 2015), we adopt the bag of words method, in which the annual reports are parsed into a matrix composed of words and word count vectors. Thus, our paper quantifies narrative sections of the annual reports for each firm-year of our sample period using Diction 7 software. Then, we measure TRD as the frequencies of risk-related words scaled by the total word count of the annual report. In doing so, we follow the Loughran & McDonald (2016) assertion of the importance of developing a wordlist in the context of each textual-subject study, as reliance on a wordlist that is derived from a different subject would probably cause spurious results. To that end, two steps are followed: (1) we develop a risk word list for financial firms, relying on two resources that provide risk disclosure regulations (i.e., Basel I, II, and III and IFRS 7 and 9) and relevant prior research (e.g., Kravet & Muslu, 2013; Elshandidy & Neri, 2015; Elamer et al., 2019; Elsayed & Elshandidy, 2020), and (2) we converted each annual report from pdf format to text format so that it could be processed by Diction 7. We further assure the reliability and validity by testing the extent to which the keywords featured in the resulting list by conducting an intensive text search using QSR 6 software as well as, by adopting manual coding for 30 randomly selected annual reports, and we find no significant differences between the two independent coders. Our final word list includes the following words: Against, allowance, burden, catastrophe, catastrophic, challenge, challenges, chance, chances, collateral, decline, declined, decrease, decreased, default, dilution, diversify, downgrade, due, fail, eligible, failure, fluctuate, fluctuation, gain, gains, illiquid, illiquidity, impaired, impairment, increase, increased, indebtedness, less, liquid, liquidity, loss, low, minimum, mitigate, mitigation, obligation, obligations, pillar, required, requirements, reverse, reversed, risk, risky, risks, riskiness, securitization, shortage, sovereign, threat, tier, unable, uncertain, uncertainty, uncertainties, VAR, viable, and volatility.

Additional references

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