Corporate Transparency and Investors' Perception of Risk with Big Data Mining

Wen Mu, Jing Zhang[(✉)], and Ziyang Li

Sichuan University, Chengdu, Sichuan, China
858874783@qq.com

Abstract. To reveal the factors impacting investors' perception of risk in stock market, this paper studied the performance of stocks with different corporate transparency under the shock of a futures hedging contingency. Through big data mining and further analysis, including crawling down announcements of listed companies with Python to scale corporate transparency, calculating the abnormal return of stocks with a market model to indicate investors' perception of risk, testing the negative impact caused by the contingency with the event study method and verifying the relationship between corporate transparency and investors' perception of risk with a cross-sectional regression model, this paper finds that the increased corporate transparency by active disclosure can effectively reduce investors' perception of risk, while the passive disclosure cannot. The innovation of this paper includes the findings of the relationship between corporate transparency and investors' perception of risk and the method of quantifying corporate transparency.

Keywords: corporate transparency · investors' perception of risk · big data mining · futures hedging · the event study method

1 Introduction

To distinguish between the risk attribute and insurance attribute of futures transactions, the participation of entity enterprises is often divided into two categories in practice: speculation and hedging. Futures speculation means expansion of the overall risk exposure of enterprises, while hedging is just the opposite. To convey positive operating signals to the capital market, domestic non-financial listed companies basically declare that they only engage in hedging business [1]. However, the interweaving of factors such as the volatility of derivatives' prices, the principal-agent problems in companies and the complexity of futures trading often make it difficult to differentiate speculation from hedging, and the newly revised "Accounting Standards for Enterprises No. 24-Hedging Accounting" does not impose mandatory requirements on the accounting treatment or presentation of enterprises. Based on the above reasons, the speculative arbitrage and earnings management behaviors under the corporate futures hedging can be highly concealed, for which negative emergencies in hedging by a listed company in the capital market can easily cause panic within investors and shock the stock prices of other companies participating in futures hedging in a chain.

On January 13, 2021, Daodaoquan Grain and Oil Co., Ltd. (hereinafter referred to as Daodaoquan) released its 2020 performance forecast announcement that the company suffered a loss of 207 million yuan in hedging business due to market forecast deviations that year. Due to improper expressions and subsequent revelations, the announcement event triggered negative public opinion on futures hedging in the capital market [2]. Since investors and listed companies have a huge information asymmetry in the futures hedging business, which may cause serious principal-agent problems, can increasing the transparency of listed companies send a positive signal to the market to enhance investors' recognition of their futures hedging business? Based on the event study method, this article examines the impact of the negative public opinion about futures hedging on stock prices of related listed companies. Then, the impact of corporate transparency on the resistance of related companies' stock prices to negative shocks is tested through regression analysis, illustrating the relationship between corporate transparency and investors' perception of the risk in futures hedging.

2 Theoretical and Research Assumptions

In recent years, many scholars have paid attention to the potential risk faced by entity companies participating in hedging. Zeidan and Mullner (2015) conducted an empirical study with a sample of 346 listed companies in 10 countries and found that unregulated power and blind self-confidence of executives, inappropriate management compensation systems and lack of formal hedging policies would lead hedging to speculation [3]. Adam, Fernando, Golubeva (2015) and Bajo, Jankensgard, Marinelli (2021) both found that management's overconfidence or narcissism could make companies conduct more subjective hedging strategies, exposing them to uncontrollable risk, along with the finding of Jankensgard (2019) that great management power could have the same consequences [4–6]. Manchiraju et al. (2016) found that the company did not consider the difference between the hedging and speculation of derivatives when formulating management remuneration policies, making management's returns from speculative gains much higher than the penalties for speculative losses. This may encourage management to take risk in derivatives trading [7]. Kim and Chance (2018) through empirical research found that non-financial companies often failed to comply with their risk control policies of currency derivatives transactions [8].

On one hand, theoretically a good hedging strategy can dampen business risk and help the steady development of real companies; On the other hand, weak internal control may expose real companies participating in hedging to greater risk of loss. So, how will the capital market respond to the hedging behavior of entity companies? Zhang and Feng (2014) used the event study method to get the capital market reaction after a listed company first disclosed hedging information and found that the disclosure of a listed company's participation in hedging would cause its stock price to fall [9]. Fernando, Hoelscher and Raman (2020) conducted a study of 112 companies in the gold mining industry finding that the announcements of gold mining companies to increase the hedging positions of derivatives will cause negative reactions in the stock market [10].

Furthermore, some other scholars have studied the impact of the disclosure content and form of derivatives transactions on investors' judgments about risk from the perspective of psychology. After conducting field experiments, Liu (2014) and He (2014) found that the disclosure content and form of derivative hedging transactions would affect investors' judgments, and full disclosure of hedging profit and loss information can significantly reduce the level of investors' perception of risk [11, 12].

Distinguished from the existing research, this article uses the negative public opinion on futures hedging triggered by emergencies to study the impact of corporate transparency on the stock prices of listed companies participating in futures hedging, which reflects the impact of corporate transparency on investors' perception of risk, to expand academic research on the factors affecting investors' perception of futures hedging risk. The article also proposes substantive suggestions for entities participating in hedging to strengthen their own risk control and for capital market regulators to strengthen the protection of small and medium investors.

Based on the existing literature and observations on the capital market, this article proposes the following three hypotheses.

H1: The negative public opinion of futures hedging is negatively correlated with the stock prices of listed companies participating in futures hedging.

H2: The corporate transparency promoted by active disclosures of listed companies themselves is positively related to the resistance to negative public opinion on hedging, that is, it can reduce the hedging risk perceived by investors.

H3: The corporate transparency promoted by third-party attention is positively related to the resistance to negative public opinion on hedging, that is, it can reduce the hedging risk perceived by investors.

3   Research and Design

3.1   Sample Selection

To study the impact of negative public opinion on futures hedging on the stock prices of non-financial listed companies, this article uses non-financial listed companies that have issued relevant futures hedging announcements within 5 years before the event (January 1, 2016, to January 12, 2021) as samples. The specific screening process is as follows. First, search for the announcements of listed companies in 2016 and later on Juchao Information Network with the keyword "futures", obtaining a total of 13902 announcements issued by 2590 listed companies. Second, delete B-share companies, financial companies and announcements issued after the event, leaving 1883 companies and 7182 announcements; Third, excluding the announcements that are not related to hedging, there are 1659 companies and 6608 announcements remaining; Forth, delete companies that have been listed for less than one year, companies with incomplete financial data, and the company Daodaoquan, and there are 1092 sample companies remaining ultimately. In addition, the financial data used in this article are all from CSMAR database. The market return rate is the daily return rate of shares (excluding the Sci-tech Innovation Board) after the weighted average of the circulating market value. All financial data have been restored.

3.2 Event Study Method

- The Event and Event Day. The event to be studied in this article is the negative public opinion in the capital market about the futures hedging of entity enterprises triggered by the huge loss of Daodaoquan in futures hedging. Since Daodaoquan issued the announcements on the evening of January 12, 2021, this article sets the day of the event ($t = 0$) as the next working day, which is January 13, 2021.
- Event Study Window. To control the aliasing effect, it is more appropriate to select a shorter time window around the event. With reference to the current mainstream practice, this article defines the event window as (-10, 10) and the estimated window as (-210, -11).
- Normal Income Model and Abnormal Return Model. If no event occurs, the rate of return during the event window period is the normal rate of return, and the difference between the actual rate of return and the normal rate of return constitutes an abnormal rate of return, reflecting the impact of the event. Since the return of the market portfolio has been able to explain the return of individual stock to a large extent, this article uses a market model to calculate the normal rate of return. The formula is as follows.

$$R_{it} = \alpha_i + \beta_i \times R_{mt} + \varepsilon \tag{1}$$

In model (1), R_{it} represents the normal return of the listed company i at time t, R_{mt} represents the return of market at time t, and α_i and β_i are parameters to be estimated. According to the data of the estimation window (-210, -11), the model can get α_i and β_i after the least square regression. Then, the abnormal return AR_{it} of each stock and the cumulative abnormal return CAR can be obtained, the significance of which can be verified by t-test.

$$AR_{it} = R_{it} - \alpha_i - \beta_i \times R_{mt} \tag{2}$$

3.3 Regression Analysis

- Dependent Variable

Investors' perception of risk about futures hedging, represented by the cumulative abnormal return (CAR). This article uses the CARs of the listed entity enterprises' stocks during the window period (-10, 10) to reflect the investors' perception of risk under the impact of negative public opinion on futures hedging.

- Independent Variables

Information disclosure quality rating of listed companies (*DSCORE*). To standardize the disclosure behavior of listed companies and improve their disclosure quality, Shenzhen Stock Exchange assesses the information disclosure performance of listed companies every year and gives four levels of A, B, C, and D (representing excellent, good, passing, and failing respectively). To ensure the authority of the data measuring corporate transparency improved by active disclosure of listed companies themselves, this article adopts the scoring results of Shenzhen Stock Exchange in 2020, and assigns values of 2, 1, 0, and -1 to the four levels from high to low respectively.

Attention of analysts (*ANALYST*). Previous documents have found that the tracking and attention of analysts can help improve the transparency of listed companies [13]. This article uses the number of analysts who followed up each listed company in 2020 as a proxy variable to measure corporate transparency that is passively enhanced due to the attention of third parties, which is different from the variable *DSCORE*.

- Control Variables

The proportion of risky assets to total assets (*RASSET*) and the proportion of risky liabilities to total liabilities (*RDEBT*). Since the current Enterprise Accounting Standards in China do not make mandatory disclosure requirements for hedging business, listed companies may disclose hedging instruments in statement items, transactional financial assets (liabilities) or derivative financial assets (liabilities). To control the impact of hedging instrument positions on investors' perception of risk, this paper constructs two control variables, *RASSET* and *RDEBT*, measuring the proportion of transactional financial assets (liabilities) and derivative financial assets (liabilities) in total assets (liabilities) at the end of 2020.

In addition, this article also controls other factors that may affect investors' perception of risk. Including corporate size *LNMVE* (natural logarithm of the total market value of listed companies at the end of 2020), corporate growth *MTB* (the ratio of market price to total assets) and the return on individual shares of listed companies *RETA* (The return rate of individual stocks after market adjustment in 2020).

We examine the effect of corporate transparency on investors' perception with the following regression model:

$$\text{CAR} = \alpha + \beta_1 \times \text{DSCORE} + \beta_2 \times \text{ANALYST} + \beta_3 \times \text{RASSET} + \beta_4 \times \text{RDEBT} + \beta_5 \times \text{LNMVE}$$
$$+ \beta_6 \times \text{MTB} + \beta_7 \times \text{RETA} + \varepsilon \tag{3}$$

4 Empirical Results and Discussion

4.1 Results of Event Study

Under the impact of negative public opinion on futures hedging, CARs of the listed entity companies' stocks and significance test results are shown in Table 1 and Fig. 1. All CARs, including CAR of the event day, are significant, indicating that the negative public opinion of futures hedging has a significant negative impact on the stock prices of the listed entity companies in the short term. Hypothesis 1 is supported.

### 4.2 Results of Regression Analysis

1) Descriptive Statistics.

Descriptive statistics for variables are reported in Table 2. Among them, under the influence of negative public opinion on futures hedging, more than 75% of the sample companies' stock prices show negative *CARs*. The standard deviation of *ANALYST* is 9.611, indicating that different sample companies received attention of analysts differently.

Table 1. CARs and Significance Test Results

Event Window	CAR	T-value
0	-0.0119***	-5.08
(-1,1)	-0.0170***	-3.47
(-2,2)	-0.0249***	-4.18
(-3,3)	-0.0215***	-3.26
(-4,4)	-0.0310***	-4.41
(-5,5)	-0.0514***	-6.53
(-10,10)	-0.0734***	-6.26

Note: *, **, *** represent significant at the level of 10%, 5% and 1% respectively.
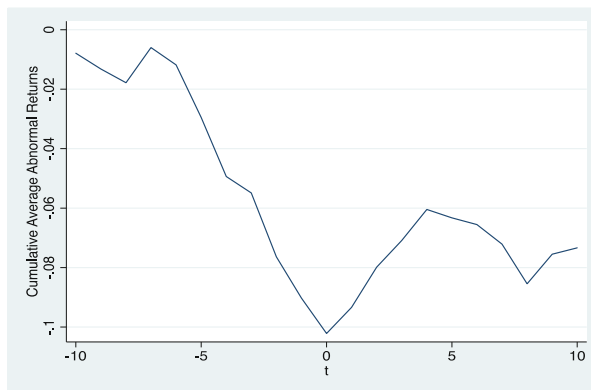
Fig. 1. Cumulative Average Abnormal Returns over Time

Table 2. Summary for Variables

VarName	Obs	Mean	P25	Median	P75	SD
CAR	1092	-0.073	-0.142	-0.082	-0.006	0.146
DSCORE	1092	0.955	1	1	1	0.685
ANALYST	1092	5.609	0	1	7	9.611
RASSET	1092	0.021	0	0.001	0.014	0.054
RDEBT	1092	0.003	0	0	0	0.019
LNMVE	1092	23.143	22.263	22.973	23.698	1.165
MTB	1092	4.541	2.242	2.952	4.1	10.441
RETA	1092	-0.024	-0.315	-0.128	0.227	0.454

Table 3. The Correlation Matrix of Variables

	CAR	*DSCORE*	*ANALYST*	*RASSET*	*RDEBT*	*LNMVE*	*MTB*	*RETA*
CAR	1							
DSCORE	0.235***	1						
ANALYST	0.223***	0.352***	1					
RASSET	-0.05	0.114	0.005	1				
RDEBT	-0.102	-0.069	-0.05	0.115	1			
LNMVE	0.248***	0.282***	0.739***	-0.096	0.052	1		
MTB	0.160**	-0.235***	0.004	-0.055	-0.017	0.011	1	
RETA	0.081	0.271***	0.388***	0.061	0.084	0.328***	-0.031	1

In Table 3 which presents the correlation coefficients between the variables, the independent variables *DSCORE* and *ANALYST* representing corporate transparency have a significant correlation with the dependent variable *CAR*, and the correlation coefficients are 0.235 and 0.223 respectively. Meanwhile, the maximum value of VIF is 2.48, indicating that there is no serious multicollinearity problem among variables.

2) Corporate Transparency and Investors' Perception of Risk About Futures Hedging.

Table 4 reports the results of the multiple regression. Both Model 2 and Model 4 show that the information disclosure quality rating of listed companies has a significant positive impact on CAR ($\beta = 0.051$, $p < 0.01$; $\beta = 0.05$, $p < 0.01$), supporting hypothesis 2. In Model 3 and Model 4, the positive relationship between attention of analysts and *CAR* is not significant ($\beta = 0.001$, $p > 0.1$; $\beta = 0$, $p > 0.1$), by which hypothesis 3 is not supported. Overall, the regression results show that only corporate transparency improved through active disclosure by companies themselves has the effect to reduce investors' perception of risk about futures hedging, while corporate transparency improved through passive disclosure by third parties does not.

4.3 Robustness Test

Listed companies, having made announcements within 5 days around the event, is eliminated to exclude the possible impact of other events (553 sample companies remain). The negative public opinion of futures hedging still has a significant negative impact on the stock prices of the sample companies.

In addition, this paper also uses *CARs* from 1 to 5 days around the event day, representing 5 different event window periods, to repeat the above regression, and the regression results are consistent with the previous one (Table 5 presents the results of the multiple regression in which the window period is 5 days around the event day).

Table 4. Multiple Regression Results

VarName	CAR			
	model 1	*model 2*	*model 3*	*model 4*
DSCORE		0.051***		0.050***
		(7.57)		(7.40)
ANALYST			0.001	0.000
			(1.56)	(0.35)
RASSET	-0.015	-0.096	-0.029	-0.098
	(-0.19)	(-1.23)	(-0.36)	(-1.26)
RDEBT	-0.88	-0.665	-0.82	-0.654
	(-3.86)	(-2.97)	(-3.55)	(-2.89)
LNMVE	0.031***	0.024**	0.025*	0.022
	(8.01)	(6.12)	(4.51)	(4.17)
MTB	0.002**	0.003***	0.002**	0.003***
	(5.39)	(7.22)	(5.39)	(7.19)
RETA	0.005	-0.009	0.001	-0.010
	(0.48)	(-0.96)	(0.11)	(-1.01)
N	1092	1092	1092	1092
R2	0.099	0.144	0.101	0.144
Adj-R2	0.095	0.139	0.096	0.139

Note: The number in parentheses is the T-value. *, **, *** represent significant at the level of 10%, 5% and 1% respectively.

Table 5. Robust Test of Multiple Regression

VarName	CAR			
	model 1	*model 2*	*model 3*	*model 4*
DSCORE		0.036***		0.039***
		(-7.9)		(-8.37)
ANALYST			-0.001*	-0.002***
			(-1.84)	(-3.26)
RASSET	0.052	-0.006	0.063	0.01

Table 5. (*continued*)

VarName	CAR			
	model 1	*model 2*	*model 3*	*model 4*
	(-0.95)	(-0.12)	(-1.16)	(-0.18)
RDEBT	-0.823***	-0.669***	-0.871***	-0.742***
	(-5.24)	(-4.34)	(-5.47)	(-4.79)
LNMVE	0.008***	0.003	0.013***	0.011***
	(-3.04)	(-1.1)	(-3.45)	(-3.05)
MTB	0.001***	0.002***	0.001***	0.002***
	(-4.43)	(-6.35)	(-4.45)	(-6.52)
RETA	-0.009	-0.019***	-0.006	-0.015**
	(-1.35)	(-2.87)	(-0.89)	(-2.17)
N	1092	1092	1092	1092
R^2	0.05	0.101	0.053	0.11
Adj-R^2	0.045	0.096	0.047	0.104

Note: The number in parentheses is the T-value. *, **, *** represent significant at the level of 10%, 5% and 1% respectively.

5 Conclusion

Previous studies have shown that the futures hedging of non-financial companies may turn to speculation due to various reasons, which leads to huge risk exposures and ultimately affects the interests of investors. This paper mainly finds that corporate transparency improved through active disclosure by companies themselves has the effect to reduce investors' perception of risk about futures hedging. Based on the findings, the following two suggestions are proposed:

First, non-financial listed companies should strive to enhance the transparency of their own information disclosure, making the most use of the supervisory role of the capital market to improve their risk control on futures hedging business.

Second, the regulator of the capital market should work to reduce the information asymmetry between listed companies and investors with more soft means such as authoritative ratings.

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