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Non-Financial Information Disclosure and High-Tech Executives' Insider Trading

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Abstract: *This study investigates the relationship between non-financial information disclosed in annual reports and the probability of high-tech executives' insider trading by analyzing the readability of annual reports of high-tech companies listed on A-share markets from 2007 to 2021. The study finds that the lower the readability of the annual report, the higher the likelihood of insider trading by high-tech executives. This suggests that executives may manipulate annual reports to "conceal the obvious." Further research indicates that transparency in financial information, private ownership, and institutional investor holdings can restrain executives' opportunistic motives. This study offers insight for improving existing market supervision mechanisms for high-tech companies.*

Keywords: *High-tech Companies, Insider Trading, Annual Report Readability, Agency Problem*

1. Introduction

As a vital channel for investors to understand the operational situation and development prospects of a company, the annual report has a significant impact on the investment decisions made by investors. Compared to financial information in the annual report, non-financial information has a greater influence on the emotions and investment decisions of small and medium-sized Chinese investors. However, compared to financial information, the regulation of textual information in annual reports in China still has loopholes. This has led to strong subjectivity in the preparation of non-audited non-financial information expressed in written form and has provided opportunities for executives who attempt to manipulate the textual information in annual reports. For example, company executives can hide bad news, exaggerate good news, or use verbose and esoteric language to seek personal interests (Huang et al., 2014; Arslan-Ayaydin et al., 2015)[1][2].

This article selects high-tech companies listed in A-shares between 2007 and 2021 as research objects to explore the logical relationship between the readability of annual reports and the reduction of holdings by executives. The results show that the lower the readability of the annual report, the more likely the company is to have insider selling transactions. High-tech company executives tend to manipulate the readability of the annual report and obscure the understanding of external investors in order to maximize their personal interests before trading stocks. Further research shows that the transparency of financial information, private property control, and institutional investor holdings can effectively reduce the governance costs of supervising executive behavior, suppress the motivation for executives to cash out and manipulate annual reports, and weaken the association between the readability of annual reports and executive selling behavior.

The conclusions of the above-mentioned study have the following contributions in both theory and practice: (1) It expands the theoretical boundaries between non-financial information and insider trading. Existing studies have mainly focused on the influence of non-financial information such as annual report tone on insiders, while this study explores the readability of annual reports as a starting point, enriching the study of the impact of non-financial information on executive share selling behavior. (2) As technology-oriented listed companies with strong development potential and high investment risks have become a "disaster-prone area" for executive share selling, and "mass innovation, entrepreneurship" has become a national strategy, in-depth exploration of the executive share selling mechanism of high-tech enterprises will better meet the needs of current economic development. (3) It provides a new idea and approach to monitor the executives of technology companies and alleviate the principal-agent problems between the shareholders and executives. Based on the research results of this article, on the one hand, it encourages management to submit annual reports with higher readability, which can to some extent block the way for the company to sell shares opportunistically and protect the rights and interests of internal shareholders. On the other hand, improving the transparency of financial information, attracting private equity and institutional investors can effectively restrain executives' motivation to manipulate non-financial information for personal gain. (4) A deep analysis of insider trading is conducive to providing inspiration for improving the existing market regulatory mechanisms, promoting the standardized development of China's stock market, and providing references for regulatory agencies to formulate accounting text information disclosure related systems.

2. Literature Review and Hypothesis

Insider trading, especially insider selling, often occurs when a company's stock is overvalued and turnover is high (Helwege et al., 2007)[3]. Since selling stocks by insiders reduces their motivation to serve the interests of both internal and external shareholders (Seyhun and Bradley, 1997)[4], when insiders are executives of the company, their selling behavior intensifies the first-class agency problem with external shareholders. Therefore, once external investors observe insider selling behavior, in order to compensate for the uncertainty caused by the company's value and agency problem, investors often choose to lower stock prices to obtain higher returns, leading to a stock market crash (Wu and Li, 2015), and compressing the profit space for insider selling. Therefore, to ensure a smooth "cash out and exit", executives often choose corresponding financial report management behaviors to conceal their selling motivation (Lang and Lundholm, 2000; Brockman et al., 2010; Zeng et al., 2018)[5][6][7].

At present, the regulatory supervision of text information disclosure of listed companies is still in a blank stage, and the cost of managing text information by company executives is almost zero (Zeng et al., 2018)[7]. Therefore, executives are likely to obstruct external investors from identifying their selling motivation and smoothly "cashing out and exiting" by managing the readability of annual report texts. According to Bloomfield's (2002) "Incomplete Revelation Hypothesis" (IRH)[8], corporate managers will increase information analysis costs to prevent market participants from collecting and analyzing statistical quantities that have negative effects on stock prices, leading to market inefficiency. Large-sample studies by Li (2008), Lo et al. (2016), and Kim et al. (2016) have all confirmed the phenomenon that corporate executives manipulate the readability of annual reports to confuse major shareholders or other investors' cognition[9][10][11]. Based on the above analysis, management can prevent stock prices from falling and ultimately achieve the goal of stock trading profits by managing the readability of annual reports to obstruct external investors from effectively identifying the signal of executive selling. Therefore, the following hypothesis is proposed:

Hypothesis 1: The lower the readability of a company's annual report, the higher the probability of executive selling.

3. Methodology

3.1. Sample and data

To investigate the impact of the readability of annual reports on insider trading in high-tech companies, this study uses all A-share listed companies in China from 2007 to 2021 as the initial sample. The sample selection procedure is as follows: (1) exclude ST companies; (2) retain only listed companies with high-tech attributes [referring to the "Industry Classification Guidelines for Listed Companies (Revised in 2012)", information technology industry (C39), information transmission, software and information technology services industry (I), and scientific research services industry (M) are classified as high-tech industries; (3) remove samples with missing financial data; (4) delete samples with missing text feature data. After the above screening, a total of 5522 sample data were obtained. To avoid the influence of extreme values on the research results, we truncated all continuous variables at the upper and lower 1% levels. Financial data is sourced from CSMAR Database, and text data is obtained by crawling using Python software. The model regression process uses Stata software to process the relevant data.

3.2. Variables description

3.2.1. Annual Report Readability

Regarding readability measurement, the academic community has very sophisticated evaluation

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criteria for measuring the complexity of English annual reports (Lehavy et al., 2011; Loughran and McDonald, 2014)[12][13]. There are currently two methods for measuring the readability of English annual reports: formulaic method and non-formulaic method. The formulaic method mostly uses the Fog Index, while the non-formulaic method is generally based on the length of the article or the size of the electronic file (Loughran and McDonald, 2014)[13]. Due to the unique grammar, vocabulary, and rhetorical techniques of Chinese, the compatibility of the above readability measurement methods with Chinese annual reports needs to be verified.

This study uses deep learning algorithms to construct the annual report readability index based on Shin et al. (2020) and the WinGo database (Wingo Financial Text Data Platform). The construction process is as follows: (1) use Word Embedding algorithm to convert each word in the annual report into a vector; (2) refer to Hierarchical Softmax and Negative Sampling to calculate the generation probability (Ps) of sentence s in the annual report; (3) generate a proxy variable for annual report readability, as shown in the following formula:

$$Readability = \frac{1}{N}\sum_{s=1}^{N} \log P_s \qquad (1)$$

Readability refers to the readability of annual reports, *Ps* refers to the probability of generating sentence *s* in the annual report, and *N* refers to the total number of sentences in the annual report. The higher the readability, the higher the frequency of word pairs in the annual report appearing in the corpus, and the higher the readability of the text. Conversely, if the frequency of word pairs appearing in the corpus is lower, the readability of the annual report will be worse.

3.2.2. Executive Share Selling

The measure of the dependent variable, executive share selling (*IT_sales*), is mainly based on the study by Zhou et al. (2015)[15]. During the same period, the trading directions of each executive in the company are inconsistent, with both selling and buying of stocks. If both types of transactions occur simultaneously during this period, the net amount after offsetting both transactions is used to indicate whether the company's stock transaction is a sell or a buy. If the result after offsetting is a sell, the company is classified as having executive share selling (executive reduction), with IT_sales value of 1; otherwise, it is classified as executive share buying (executive increase), with IT_sales value of 0.

Table 1: Variable definitions

Variables	Definition
IT_sales	Whether the company experiences executive share selling, 1 for "yes", and 0 for "no".
Readability	The readability of annual report, see equation (1)
Size	Firm size, the natural logarithm of the company's total assets.
Lev	The debt-to-asset ratio, which is the total liabilities divided by the total assets.
ROA	The return on total assets, which is the net assets divided by the total assets.
Age	The length of time a company has been listed on the stock exchange.
B/M	Market capitalization divided by total assets.
Salary	The proportion of the first-ranked executive's salary in the total executive compensation.
Property	Judging based on the nature of actual control, 0 represents non-state-owned enterprises, and 1 represents state-owned enterprises.
Duality	If the chairman and general manager are the same person, the value is 1; otherwise, the value is 0.
INDdirector	The ratio of the number of independent directors to the size of the board of directors.
Boardsize	The logarithm of the number of directors on the board of directors.

3.3. Model Specification

To test the hypothesis, this paper uses the following formula to construct the model:

$$IT_{sales} = \alpha + \beta_1 \times Readability + \beta_i \times \sum Controls + \sum Industry + \sum Year + \mu \qquad (2)$$

The dependent variable is executive share selling (*IT_sales*), and the independent variable is annual report readability (*Readability*). This paper mainly studies the direction and significance of the coefficient of annual report readability after controlling for the impact of company characteristics on executive share selling. If the hypothesis is correct, the significance of the coefficient of annual report readability will be negative.

The model also controls for company size (*Size*), leverage ratio (*Lev*), return on assets (*ROA*),

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company listing years (*Age*), book-to-market ratio (*B/M*), executive compensation ratio (*Salary*), property rights (*Property*), dual rights structure (*Duality*), independent director ratio (*INDdirector*), and board size (*Boardsize*) which may affect insider trading. In order to eliminate the influence of macroeconomic conditions on the results, the year (*Year*) and the industry to which the company belongs (*Industry*) are also controlled. The detailed definitions of all variables used in the model are shown in Table 1.

4. Empirical Results

Table 2 reports the regression results of the readability of annual reports and executive selling. The regression results in Table 2 show that the readability of annual reports (*Readability*) and executive selling (*IT_sales*) are significantly negative at the 1% level, indicating that the lower the readability of annual reports, the more likely the executives are to sell the company's stocks. As readability is a representation of information disclosure quality, the lower the readability of annual reports, the poorer the quality of the annual report disclosure, and the more likely executives are to engage in some cosmetic or non-compliant behavior, increasing the likelihood of insider selling.

Table 2: Regression Results of Baseline Model

Variables	*IT_sales*	Variables	*IT_sales*
Readability	-0.071***	Salary	-0.019***
	(-3.64)		(-3.05)
Size	0.047	*Property*	-1.028***
	(0.67)		(-6.64)
Lev	-0.671	*Duality*	0.193**
	(-0.98)		(2.15)
ROA	-0.075	*INDdirector*	-0.006
	(-0.10)		(-0.62)
Age	0.325***	*Boardsize*	0.014
	(4.92)		(0.39)
Constant	-2.129	*Observations*	5,522
	(-1.46)	*Industry*	Control
B/M	-1.562***	*Year*	Control
	(-5.48)	*Pseudo R-squared*	0.0837

*** p<0.01, ** p<0.05,* p<0.1

We also test the robustness of the empirical results. Following Loughran and McDonald (2014) [13], the measurement method of readability variable is changed to the size of the electronic document of annual reports. The larger the file size, the longer the length of the annual report, and the more complex the information investors need to obtain from the annual report, resulting in lower readability. The size of the document is transformed by taking its reciprocal and then using the range method to obtain the new readability variable (*Read_size*). The regression results, shown in Table 3, demonstrate that after changing the measurement method of readability variable, the negative correlation between readability of annual reports and executive stock sales is still significant at the 5% level, which validates Hypothesis 1 once again.

Table 3: Regression results of Robustness Test

Variables	*IT_sales*	Variables	*IT_sales*
Read_size	-2.906**	*Salary*	-0.019***
	(-2.43)		(-3.03)
Size	0.077	*Property*	-1.040***
	(1.11)		(-6.68)
Lev	-0.674	*Duality*	0.190**
	(-0.99)		(2.12)
ROA	-0.074	*INDdirector*	-0.004
	(-0.10)		(-0.42)
Age	0.343***	*Boardsize*	0.018
	(5.14)		(0.51)
B/M	-1.576***	*Constant*	-1.073
	(-5.53)		(-0.70)
Industry	Control	*Observations*	5,099
Year	Control	*Pseudo R-squared*	0.0807

*** p<0.01, ** p<0.05,* p<0.1

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5. Conclusion

This study explores the relationship between annual report readability and insider selling in A-share high-tech companies listed from 2007 to 2021. The empirical analysis finds a negative correlation between the annual report readability of Chinese listed companies and the occurrence of insider selling transactions, that is, the lower the readability of the annual report, the greater the probability of insider selling. This suggests that corporate insiders may manipulate the readability of the annual report to opportunistically engage in insider selling and gain excess returns. However, the strength of this relationship is influenced by corporate financial information transparency, ownership structure, and institutional investor holdings. Specifically, when the transparency of corporate financial information is high, the company is privately owned, and institutional investor holdings are high, the negative correlation between annual report readability and insider selling will be weakened.

This study has certain implications and suggestions for the development of information disclosure systems, regulatory mechanisms, and corporate governance. Firstly, it is suggested that China should improve and standardize the accounting information disclosure system and enhance the non-financial information disclosure content of annual reports to improve the readability of annual reports. Companies should be required to disclose annual reports in plain language, with moderate length and clear meaning, so that investors reading the annual report can understand it while ensuring its professionalism. Moreover, exploring a more authoritative measure of annual report readability could be considered for evaluation purposes. Secondly, by starting from the transparency of financial information disclosure, the space for corporate insiders to manipulate non-financial information could be compressed. The research finds that higher financial information disclosure transparency can effectively reduce the motivation for insider managers to strategically disclose annual report readability and reduce the governance cost of supervising corporate insider behavior. Therefore, it is suggested to further improve the quality of corporate financial information disclosure and improve the corporate information environment while effectively constraining corporate insider opportunistic behavior. Finally, attracting high-quality external investors, optimizing corporate governance structure, and suppressing insider opportunistic behavior should be prioritized. The study finds that the participation of non-state-owned controlling shareholders and institutional investors can reduce the degree of ownership dispersion, reduce the governance cost of shareholders supervising insiders, and weaken the motivation for insiders to manipulate the readability of the annual report for personal gain. Therefore, it is recommended that companies continue to attract high-quality non-state-owned enterprise shareholders and institutional investors, strengthen external governance, and effectively constrain insider opportunistic behavior while safeguarding the interests of the company and external investors.

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