

Equity Incentive and Idiosyncratic Volatility Using Dual Fixed-effect Method: Evidence from China

Jengshin Chiang^{1,* , †}, Donghao Li^{2,* , †} and Ningyuan Zhou^{3,* , †}

¹University of California Santa Barbara, Guangzhou, China

²Boston College, Lanzhou, China

³Emory University, Beijing, China

*Corresponding author: jengshin@ucsb.edu

libuc@bc.edu

nzhou28@emory.edu

[†]These authors contributed equally.

Abstract. This article study the relationship between equity incentive and the Idiosyncratic volatility of the stocks. Based on the data among the A-share listed companies, the article use the dual fixed-effect method with industry and time fixed to build a model and use Stata to do the empirical analysis. As a result, the study shows that equity incentive increases the idiosyncratic volatility of the stock, and impact of equity incentive on idiosyncratic volatility is more pronounced in non-state-owned firms, with fewer analysts and a lower ratio of institutional investors. Robustness is checked by replacing different equity incentive variables and adding lag items.

Keywords: Equity incentives; idiosyncratic volatility; China.

1. Introduction

Equity incentives have been broadly practiced in firms. And there is much research that studies the consequences or impacts that equity incentives bring are. Previous studies discover the relationship between equity incentives and earning management [1], accounting fraud [2], operating structure [3], and corporate fraud [4]. In summary, equity incentives influence multiple aspects of firms and consequently increase or decrease the value of firms, which demonstrates the importance of practice and effectiveness of equity incentives.

Previous studies mainly hold two opposing arguments. One perspective is that there is a positive effect of equity incentives on corporations' performance. As equity incentive aligns the interest of executives with the interest of corporations [5]. The other perspective is the negative effect of equity incentives on corporations' performance. As the decisions of executives might diverge from the decisions which maximize the corporates' value [6]. However, the effect of equity incentives is still unclear regarding corporate idiosyncratic risk.

Therefore, it is important to study the effectiveness of equity incentives. Unlike the previous studies, this study aims to focus on the relationship between equity incentives and corporate idiosyncratic risk.

The capital asset pricing model (CAPM) builds on the portfolio theory and predicts that all investors hold the market portfolio in equilibrium. As a result, only systematic risk is priced in equilibrium, and idiosyncratic risk is not priced [7]. However, in the real world, idiosyncratic risk is also important in an investigation. Jensen, Black, and Scholes found a relationship between idiosyncratic risk and return in 1972 [8], and Fama-French three factor model gave a way to calculate the idiosyncratic volatility [9]. Glover and Levine's study also found that reducing the idiosyncratic volatility through average stock variance would increase investigation return [10]. Further studies showed that factors like CEO's incentive on firm policy are related to the idiosyncratic volatility [10], and Cambell et al. use a disaggregated approach to study the volatility of common stocks at the market, industry, and industry firm levels [11]. In this way, it is important to study idiosyncratic volatility and what would influence it.

China's equity incentives have been formally implemented for more than ten years, and a considerable number of equity incentive plans have entered the exercise period. However, most of the existing studies have focused on the design of equity incentive plans, announcements, and the opportunistic behavior of executives at the grant stage. The analysis of the effect is less, and it mainly focuses on the benefit synergy effect brought by equity incentives, ignoring the risk-taking incentives. Right Incentive Program. According to a survey conducted by Hewitt, a human resource consulting company, the share of top management equity incentives for companies with annual revenues of more than US\$10 billion increased from 19% in 1985 to 65% in 2010. Among the top 500 companies in the United States, 80% of the companies have adopted equity incentive plans based on stock futures rights. Equity incentives have been widely developed in the United States, Japan, the United Kingdom, and other European countries and have achieved good results. Domestically, equity incentives have not been launched for a long time, but they are developing quickly. The "Administrative Measures for Stock Option Incentives for Listed Companies (Trial)" (hereinafter referred to as the "Trial Measures") promulgated by the China Securities Regulatory Commission on December 31, 2005, opened the curtain for equity incentives in China. The China Securities Regulatory Commission launched successively in 2008 The three memos constitute the legal basis for equity incentives in China. As a long-term incentive mechanism, equity incentives have high hopes in the new round of state-owned assets reform. All local state-owned assets reform plans propose to implement equity incentives for senior managers and core technical personnel. According to this article, a total of 526 companies have implemented equity incentive plans by the end of 2014. According to the types of incentives, nearly 70% of companies have selected equity incentive incentives.

This paper examines the relationship between equity incentives and corporate idiosyncratic risk using a sample of 2572 A-share listed companies' data from 2007 to 2019. This research find that the practice of equity incentives is positively associated with corporate idiosyncratic risk. This association is robust due to a series of evidence: estimators significant, replacing Equity1 with two other ways of describing equity incentive and taking the lag term to alleviate endogeneity. Further analysis shows the effect of equity incentives is stronger in firms that are non-state-owned and with fewer analysts and a lower ratio of institutional investors.

This study contributes to the extant literature in two ways. First, this research further build on the comprehension of the effectiveness of equity incentives as compensation to executives. There is a tradeoff between whether equity incentive aligns the interest of executives or equity incentive seduces executives to commit manipulation. Based on our finding, committing manipulation is more likely to occur and therefore increases corporate idiosyncratic risk. Second, to the best of our knowledge, this study is the first to examine the effectiveness of equity incentives on firms that are non-state-owned and with fewer analysts and a lower ratio of institutional investors. As there, our analysis of the data displaces that the positive relationship between equity incentives and idiosyncratic risk of firms would be more pronounced for non-state-owned firms with fewer analysts and a lower ratio of institutional investors. This further implies that the effectiveness of equity incentives is more remarkable in weak firms in external control, which offers a different insight for future study.

The structure of this study is organized as follows: Our hypothesis is in Section 2. The research design and model are given in Section 3. The empirical result is discussed in Section 4. The conclusion is offered in Section 5.

2. Hypotheses development

Prior studies argue that the practice of equity incentive may more or less have influences on corporate performance. Factors that play roles in the relationship between equity incentive and corporate performance include accounting fraud [1], earnings management [2, 3], and corporate fraud [4].

Previous studies mainly contain two different perspectives on the relationship between equity incentives and corporate performance.

The first perspective is that equity incentives granted to executives might increase corporate performance [5]. The value of equity incentives is associated with the value of corporations. Therefore, equity incentives help aligns the interest of executives with the interest of corporations because their wealth is associated with the value of equity incentive. As a result, equity incentives encourage executives to help increase the value of corporations. Because corporate performance is indirectly associated with idiosyncratic risk of firms, we, therefore, hypothesize that

H1a: Equity incentives increase corporate idiosyncratic risk, other things being equal

On the other hand, the agency theory claimed by Jensen and Meckling [6] suggests that there is a negative relationship between equity incentive and corporate performance as the decisions of executives might diverge from the decisions which maximize the corporates' value. Which induces executives to commit manipulation, therefore, reducing the value of corporations. Therefore, our alternative hypothesis is

H1b: Equity incentives do not increase corporate idiosyncratic risk, other things being equal.

3. Research Design

3.1 Construction of Sample

Our samples comprised A-share listed companies in China. We drop all the finance companies and the Special Treatment companies since their balance sheet would be abnormal or invalid. In the end, we have the data of 2575 companies and from 2007 to 2019. Our data are all from the China Stock Market & Accounting Research (CSMAR) database.

3.2 Models

To test the hypothesis, we used the dual fixed-effect method, with industry and time fixed. The equation would be

$$IVOL = \beta_0 + \beta_1 Equity1 + \sum \beta_q(qth\ Contral\ Variable) + \epsilon \quad (1)$$

In this equation, the *IVOL* is idiosyncratic volatility of the stock; *Equity1* is the degree of incentive equities; and our Control Variable including Age, Size, book-to-market ratio, return on asset, the ratio of the mean of firm-specific weekly returns, firm financial leverage, and the growth of firms.

3.3 Variables

3.3.1 Dependent Variable: IVOL

IVOL is the idiosyncratic volatility of the stock. Regressing the daily excess returns of individual stocks [12] on the excess return on a broad market portfolio, the difference between the return on a portfolio of small stocks and the return on a portfolio of large stocks and the difference between the return on a portfolio of high book-to-market stocks and the return on a portfolio, *IVOL* is computed as the standard deviation of the regression residuals [7].

$$R_{it} - r_t = \alpha_{it} + b_{it}(R_{mt} - r_t) + s_{it} SMB_t + h_{it} HML_t + \epsilon_{it} \quad (2)$$

3.3.2 Testing Variable: Equity1

Equity1 is the degree of the incentive equities given to the executive board as the price of the stock increases by 1 present, the ratio of the increased value of the equity within the total wage and equity. Among the formula, Price, Share, Cashpay are used to illustrate the stock price at the end of the year, the end-term stock amount held by the executive board, and the fixed total wage of the executive board. The higher this value is, the stronger incentive this equity gives.

$$Equity1 = \frac{0.01 * price * share}{0.01 * price * share + Cashpay} \quad (3)$$

3.3.3 Control Variable

Age is the established years of the company. *Size* is the size of the company. *BM* is the book-to-market ratio, the book value of equity divided by the market value of equity [13]; *ROA* is the return on asset, the net value is divided by the total asset. *Ret* is the ratio of the mean of firm-specific weekly returns. *Lev* is firm financial leverage, the total debt divided by the total asset, and *Growth* is the growth rate of turnovers.

Table 1. Variables

variables	
IVOL	idiosyncratic volatility of the stock
Equity1	degree of the incentive equities
Age	established years of the company
Size	size of the company
BM	book-to-market ratio
ROA	return on asset
Ret	Return ratio
Lev	Firm financial leverage
Growth	the growth rate of turnovers

4. Empirical analyses

4.1 Descriptive statistics

For all the variables from the 22004 samples. Idiosyncratic risk (IOVL) has a mean of 0.081 and a median of 0,079. The standard deviation is 0.025. Since the standard deviation is small, which means the IOVL is accurate and distributed centralized and equally. It implies all the stocks and companies in the A-share have similar IVOL due to the decision for the company. Similarly, for variable degrees of incentive equities (Equity1), the standard deviation is 0.326, less than 1. As a result, Equity1 is accurate and centralized. All the remaining controlled variables, besides the Size, all have a standard deviation less than 1 means they are centralized distributed. Size is not a crucial variable for determining IVOL, and it is reasonable such that thousands of companies must have different sizes, so the standard deviation is larger than 1. In general, all the variables we define are applicable for our regression.

4.2 Cross-sectional simple correlations.

I investigate the bi-variate relations between all these variables. The correlation between Equity1 and idiosyncratic volatility (IVOL) can be regarded as a univariate test, and Table 2 presents the time-series mean correlation coefficients. The correlation between Equity1 and the IVOL is 0.048 and statistically significant at the 1% level. The univariate tests, therefore, imply a positive relation between IVOL and Equity1. Consistent with the findings in the literature, the IVOL is negatively related to size and age and is positively related to Lev and past returns. All of the correlation implies that conditional IVOL is negatively related to size and the book-to-market equity ratio. Small firms tend to have higher IVOL than large firms; growth firms tend to have higher idiosyncratic volatility than value firms. And growth has almost no relation with size since they are significant only at 10% level. Both returns of assets in percentage, liability assets ratio in percentage influences Ret since they are significant at 5% level. And there is no serious correlation problem between these variables.

4.3 Univariate analysis

For table 3, through the t-test. Between G1(0) and G2(1), IVOL has a mean difference of -0.002 which means samples in G2(1) have larger IVOL than samples in G1(0). It is significant at the 1% level since the t-value is -5.3, so we should reject the null hypothesis. The company with high

incentive equities has a significantly higher idiosyncratic risk. Although the mean difference of IVOL between different Equity1 companies is not large, there still exists a significant difference. Again, this proves our hypothesis that companies with high incentive equities have a higher idiosyncratic risk, and Equity and IVOL are positively correlated. All other variables are different between the two groups with different incentive equities. For example, not surprisingly, the company with lower incentive equities has a larger size due to the prior research. Other variables in the two groups followed well as in our assumption.

4.4 Standard Regression

Table 4 lists the test results of the relationship between equity incentives and idiosyncratic volatility. From column (1) of Table 4, the first regression shows the regression result without other controlled variables. The dependent variable is IVOL, and the independent variable is Equity1. It can be seen that under the full sample, the coefficient of Equity1 is 0.0009 and is positive at the 1% significance level. It is stated that without control of other variables, the incentive equities have a positive relation with idiosyncratic risk for the company. In other words, the more incentive equities the company has the more idiosyncratic risk.

They are going a step further, according to add all the control variables to the test. From column (2) of Table 4, the second regression shows that with all the controlled variables, the coefficient of Equity1 is still positive at the 1% significance level, indicating that Equity1 still has a positive effect on IVOL. Just same as our assumption, no matter other factors, the more incentive equities the company has, the more idiosyncratic risk the company takes. The possible reason why there exists a positive relation between incentive equities and idiosyncratic risk is that the equity incentive granted to executives might increase corporate performance. (Albuquerque, 2014) The value of equity incentives associates with the value of corporations. Therefore, equity incentives help aligns the interest of executives with the interest of corporations because their wealth is associated with the value of equity incentive. As a result, equity incentives encourage executives to help increase the value of corporations. Because corporate performance is indirectly associated with firms' idiosyncratic risk, all other controlled variables influence the IVOL since they all have a significant influence at the 1% level. For example, the size has a negative coefficient means the larger the company is, the smaller the idiosyncratic risk. From the regression results, *Equity1*, *Ret*, *Lev*, and *Growth* have a positive influence on IVOL, and *Size*, *Age*, *BM*, and *Roa* has a negative influence on IVOL, which are all significant at a 1% level. As we controlled all the variables and both year and industry effect, this regression proves our hypothesis. This means that companies with higher incentive equities are less likely to abandon those high-risk investment projects with a positive expected net present value in the investment decision-making process and have stronger risk-taking actions.

4.5 Heterogeneity Analysis

Table 5 lists the impact of incentive equities on idiosyncratic risk differently in SOE firms, a number of analysts, and different proportional of institutional ownership. The inspection results are shown in Table 5. Columns (1) divide companies into two groups: state-owned and private. The first column is the result of SOE. The coefficient of SOE is negative and significant at the level of 1%, indicating that the SOE company has a negative impact between equity incentives and idiosyncratic volatility. In other words, in the state-owned company, the influence of incentive equities will have less effect on the IVOL. The risk-taking of private enterprises can improve the capital allocation efficiency of the enterprise. Consistent with the previous article, this article further differentiates companies according to the number of analysts. In column (2), we can clearly see that the coefficient on *Equity1_Analyst* is negative and significant at 1%. Since the term's coefficient is significantly negative, a greater number of analysts the company has will lower the effect of incentive equities on the IVOL. Similarly, the results on column (3), the coefficient on *Equity1_Ins* is -0.015, which is

negative and significant at 1%. This means that a high proportion of institutional ownership companies will lower the effect of incentive equities on the IVOL.

In conclusion, they are comparing both the results in columns (1), (2), and (3), the impact of incentive equities on the idiosyncratic risk of the company increase in the private company, with less analyst and lower proportional of institutional ownership. This implies a common theory that when the external regulatory environment is weak, the impact of incentive equities on idiosyncratic risk is more strength. It may be that the salary control of state-owned enterprises will make it difficult to design executive incentive contracts to function. Since the external regulatory environment is weak, the top executive will have more influence and power for the whole company, including the idiosyncratic risk. Non-profit goals make state-owned enterprise executives more pursue implicit incentives such as return on control rights and political promotion, but they are not sensitive to equity incentives. Others studied the dilemma of the positioning of state-owned enterprise equity incentives and believed that state-owned enterprise equity incentives have both incentives, benefits, and rewards. The positioning is unclear, and no good incentives have been achieved. The private enterprises in the sample are many in the high-competition, high-growth, and high-tech industries and are willing to take on more risks to win in the market competition. Therefore, compared with state-owned enterprises, the equity futures rights of private enterprises are more likely to exert risk-taking incentive effects.

5. Robustness checks

To test whether our results are robust, this article also carried out the following robustness test. The results are shown in Table 6. The result shows for both Equity2 and Equity3, the coefficients are still positive and significant at the 1% level. So clearly, when we change the independent variable Equity, our result still followed our hypothesis, and so the result and regression are robust. For the column (3), (4), and (5), when we regression the lag $t+1$, $t+2$ and $t+3$ idiosyncratic volatility as the dependent variable, the coefficient on the equity is still all still positive and significant at 1% level. We find the results are broadly the same as our main findings for all the regression results, and the result is robust.

6. Conclusion

Based on a sample of 2575 A-share listed companies' data from 2007 to 2019, we examine the relationship between idiosyncratic volatility and equity incentive in this paper. Through the empirical result, we find that the idiosyncratic volatility is positively related to the incentive equity. In other words, a company with a higher degree of equity incentive on the executive board tends to have a higher idiosyncratic risk. Moreover, our study shows that the impact of equity incentive is more pronounced in non-state-owned firms, with fewer analysts and a lower ratio of institutional investors. In addition, we replace Equity1 with two other ways of describing equity incentive, and we also add lag items to test the robustness of our model. As a result, we find the estimators significant, indicating our model to be robust.

Overall, our study indicates that the equity incentive would increase the idiosyncratic volatility of the firm. The companies that utilizing a high degree of equity incentive tend to have higher idiosyncratic risk. This result illustrates a negative point of this common-utilized policy. Though the equity incentive can reconcile the interest of the executive board and shareholders and incentive the managers to work for the firm's interest, this negative point of increasing idiosyncratic risk is also very significant. There should be a trade-off of this policy. In addition, our study also implies that the lack of supervision would lead to a more significant influence on idiosyncratic volatility. According to the study result, we suggest the firms consider both sides of equity incentive thoroughly and carefully before utilizing it and apply more intensive supervision on the executive boards.

References

- [1] Erickson, M., Hanlon, M., & Maydew, E. L. (2006). Is there a link between executive equity incentives and accounting fraud? *Journal of accounting research*, 44(1), 113-143.
- [2] Cheng, Q., & Warfield, T. D. (2005). Equity incentives and earnings management. *The accounting review*, 80(2), 441-476.
- [3] Alhadab, M., & Al-Own, B. (2019). Earnings management and equity incentives: evidence from the European banking industry. *International Journal of Accounting & Information Management*.
- [4] Hass, L. H., Tarsalewska, M., & Zhan, F. (2016). Equity incentives and corporate fraud in China. *Journal of business ethics*, 138(4), 723-742.
- [5] Albuquerque, A. M., Papadakis, G., & Wysocki, P. D. (2014). The impact of risk on CEO equity incentives: Evidence from customer concentration. Available at SSRN 1944015.
- [6] Jensen, M. C., & Meckling, W. H. (1976). Theory of the firm: Managerial behavior, agency costs and ownership structure. *Journal of financial economics*, 3(4), 305-360.
- [7] Fangjian Fu, Idiosyncratic risk and the cross-section of expected stock returns. *Journal of Financial Economics*. 91(2009) 24-37
- [8] Black, F., Jensen, M.C. and Scholes, M. The Capital Asset Pricing Model: Some Empirical Tests. *Studies in the Theory of Capital Markets*, (1972) 79-121.
- [9] E. Fama, K. French, Common risk factors in the returns on stocks and bonds. *Journal of Financial Economics* 33 (1993) 3-56.
- [10] B. Glover, Oliver Levine, *Journal of Financial Economics* Volume 126, Issue 2, November 2017, Pages 320-341.
- [11] Campbell, John Y., Martin Lettau, Burton G. Malkiel, and Yexiao Xu, 2001, Have individual stocks become more volatile? An empirical exploration of idiosyncratic risk, *Journal of Finance* 56, 1-43.
- [12] Fama, E., French, K., 1992. The cross-section of expected stock returns. *Journal of Finance* 48, 427–465.
- [13] CC Tsai, JL Liu, YC Liu, CW Hao, Director's and officers' liability and stock price crash risk. *Journal of Corporate Finance*. 37(2006) 173-192.