The Effect of Hedging with Property-Liability Insurance on the Probability of Financial Distress

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Abstract

Background/Objectives: This paper examines how hedging activities with property-liability insurance affect the likelihood of a firm's financial distress. To this end, this study employs a pooled Ordinary Least Squares (OLS) regression with a dependent variable, "distance-to-default". **Methods/Statistical Analysis:** This study proxies for a firm's hedging activities using the extent of property-liability insurance use. As robustness checks, this study re-estimates a regression equation using a dependent variable, Z-scores. This study further performs an analysis using the fixed effects panel regressions. **Findings:** This study finds that the extent of property-liability insurance use is positively related to proxies for the likelihood of financial distress, proxied as "distant-to-default" and Z-scores. The findings indicate that firms with a higher extent of property-liability insurance use are less likely to be subject to financial difficulties. **Improvements:** Overall, this study suggests that firms can lower the likelihood of their financial distress using hedging with property-liability insurance.

Keywords: Financial Distress, Hedging, Property-Liability Insurance

1. Introduction

According to the hedging theories, a firm's hedging activities help reduce a likelihood of its financial distress. For example, firms may use foreign currency derivatives to hedge their financial difficulties[1]. Prior research mainly focuses on a firm's hedging activity with derivatives in examining its effects on the likelihood of financial constraints. In contrast, this study is the first to examine how a firm's hedging with property-liability insurance affects the likelihood of financial distress.

To hedge risk exposures with derivatives, it is needed for knowledge about financial engineering other than primary businesses. Small firms have a limited access to derivatives in their hedging activities compared to large firms. Firms in countries with less developed derivatives markets have a limited use in derivatives for hedging risk exposure. Similarly, according to the study[2], 21.6%

of the 1,308 firms in their sample use derivatives and, among them, large firms have higher percentages in the derivatives use.

On the other hand, many firms purchase property-liability insurance since it does not require professional staffs with financial knowledge and costs associated with managing the insurance are small. It is commonly recognized that insurance is effective in managing pure risks[3]. It is important to study the effect of a firm's insurance use on the likelihood of financial constraints. While it cannot be identified whether a firm's use of derivatives is attributable to hedging activities or speculative motives, one can purely capture a firm's hedging activities by using property-liability insurance[4].

This study empirically examines the effect of hedging activities with property-liability insurance on the likelihood of a firm's financial difficulties. This study uses the extent of property-liability insurance use to capture a

firm's hedging activities. This study finds that firms with a higher extent of property-liability insurance use are less likely to face financial distress. This study contributes to the literature on risk management by providing empirical evidence and practical explanations of risk management theories. Therefore, this study expects to fill gaps between theoretical and empirical research.

The rest of the study is structured as follows. Section 2 reviews prior literature. Section 3 discusses the research design. Section 4 concludes with the empirical results.

2. Prior Literature

The traditional asset pricing theory suggests that systematic risk only affects firm value while investors can minimize unsystematic risk by holding diversified portfolios. Thus, it is not necessary for firms to hedge unsystematic risk in order to enhance their firm value. One seminal study that assumes perfect markets with no taxes and financial frictions demonstrates that a firm's hedging or risk management is irrelevant to firm value[5].

There, however, exist internal and external market imperfections, such as financial frictions, in capital markets. A firm's hedging activity can affect its cash flow and consequently firm value. Several studies show that, as firms reduces the variability of future cash flow through their risk management strategy, the firms can overcome their financial distress and consequently enhance their firm value[6–10]. Firms can also reduce future cash flow volatility by managing risk, thus decreasing the likelihood of financial constraints[9]. Firms can reduce expected bankruptcy costs by purchasing property insurance[11].

Prior literature documents that the likelihood of financial distress is one of the determinants in a firm's hedging decision[12–16]. These prior studies capture a firm's likelihood of financial difficulties using leverage and show that leverage negatively affects a firm's hedging activity. The result indicates that firms with higher leverage have a higher level of hedging.

One study[1] investigates whether foreign currency derivatives can decrease a firm's likelihood of financial constraints. The author shows that firms with a higher level of foreign currency derivatives have lower likelihood of financial distress. The finding suggests that the hedging with derivatives is effective in reducing the likelihood of financial difficulties. An analysis for the hedging effect through derivates has a limitation because whether a firm's use of derivatives is attributable to hedging

activities or speculative motives cannot be identified. The use of property-liability insurance purely reflects a firm's hedging activities. In contrast to the prior study[1], this study uses the extent of property-liability insurance use to capture the pure effect of hedging activities.

3. Data and Research Design

3.1 Data
This study extracts financial data from KIS-Value Database, which is provided by Korea Investors Service (KIS) from 2005 to 2011. The Korea Investors Service, Inc. is affiliated with Moody's Investors Services and is one of three major credit rating agencies in South Korea. This study uses non-financial firms with fiscal year ends in December, listed on the Korean Exchanges (KRX). Firms that have impaired capital, qualified audit opinions, or are involved in Mergers and Acquisitions (M&A) are omitted. Firm-year observations with missing values are excluded. The sample includes 3,080 firm-year observations between 2005 and 2011. Sample selection bias is not a serious concern since a majority of Korean firms have their fiscal year ending in December.

3.2 Model Specification and Variables
As noted earlier, this study examines how a firm's hedging activity influences the likelihood of financial distress. Following the previous study[1], these study uses "distance-to-default" to capture a firm's likelihood of financial distress. The regression equation is specified as follows:

$$\text{DISTANCE}_{it} = b_0 + b_1 * \text{INSURANCE}_{it} + b_2 * \text{LEV}_{it} + b' * x_{it} + u_{it}, \qquad (1)$$

where the dependent variable is the "distance-to-default" (DISTANCE). The x_{it} include columns with other control variables. This study also includes year and industry dummies in the Equation (1).

This study uses two measures, "distance-to-default" and Z-scores, to capture a firm's likelihood of financial distress. To calculate the 1-year "distance-to-default," This study follows the procedure of one study[1] and use structural default model proposed by another sutdy[17]. The "distance-to-default" is defined as the number of standard deviations of assets growth by which a firm's assets exceed liabilities. Financial statements do not reflect a firm's future prospects due to their characteristics of backward looking. The lager "distance-to-default"

indicates that a firm has less likelihood of financial constraints. Furthermore, following the prior study[18], this study proxies for the likelihood of financial distress with the Altman's Z-score. This study calculates the Z-score as follows: $1.2 \times A + 1.4 \times B + 3.3 \times C + 0.6 \times D + 1.0 \times E$, where A is the ratio of working capital to total assets; B is the retained earnings scaled by total assets; C is the earnings before interest and taxes scaled by total assets; D is the ratio of market value of equity to book value of total debt; E is the sales scaled by total assets.

Our main explanatory variable of interest is the extent of property-liability insurance use (INSURANCE). Following the previous study[3], this study measures INSURANCE as the ratio of annual expenditures for property-liability insurance in the current year to tangible assets minus land in the previous year. This study expects the coefficient on INSURANCE to be positive.

Based on the prior studies[19], this study controls for leverage (LEV), firm size (SIZE), cash holdings (CASH), return on asset (ROA), stock return (RETURN), stock return volatility (VOL). More specifically, LEV is the ratio of total debt to total assets. It is know that a firm's financial leverage is positively related to the likelihood of financial distress[1,20]. Consistent with previous studies[20], this study expects a positive relation between leverage and the likelihood of financial difficulties. SIZE is the logarithm of total assets. Larger firms are less subject to financial constraints[1]. CASH is the cash divided by total assets. Firms with higher cash holdings have lower likelihood of financial distress[1]. ROA is the ratio of net income to total assets. Finally, VOL is the standard deviation of daily stock return multiplied by the ratio of the market value of equity to the market value of total assets. Table 1 shows summary statistics for relevant variables.

Table 1. Descriptive statistics

	N	Mean	Std.Dev	Min	Max
DISTANCE	3,080	2.570	1.117	1.131	5.715
INSURANCE	3,080	0.010	0.029	0.000	0.226
LEV	3,080	0.441	0.192	0.059	0.875
SIZE	3,080	26.562	1.503	23.953	30.820
CASH	3,080	0.055	0.057	0.000	0.281
ROA	3,080	0.028	0.082	-0.367	0.198
RETURN	3,080	0.004	0.233	-0.494	0.900
VOL	3,080	26.608	14.083	3.925	75.440

Table 2 shows the Pearson correlations among the variables. INSURANE is positively and significantly correlated with DISTANCE ($p<0.01$). The correlation indicates that firms with a higher extent of property-liability insurance use are less likely subject to financial distress. Due to the limitation of the univariate analysis, this study further performs a multivariate analysis after controlling for previously identified determinants of likelihood of financial difficulties.

4. Empirical Results

This study investigates the relation between financial distress and extent of property-liability insurance use after controlling for leverage, firm size, cash holding, return on asset, stock return, and volatility. All continuous variables are winsorized at the 1% and 99% levels. This study uses White's heteroskedasticity robust standard errors.

The results from the pooled Ordinary Least Squares (OLS) regressions are shown in Table 3. The coefficient on INSURANCE is positive and significant ($p<0.01$), indicating that firms with a higher proportion of property-liability insurance are less likely to face financial constraints.

Table 2. Correlations

	A	B	C	D	E	F	G
A. DISTANCE	1						
B. INSURANCE	0.068***	1					
C. LEV	-0.543***	0.015	1				
D. SIZE	-0.054***	-0.072***	0.170***	1			
E. CASH	0.391***	0.119***	-0.135***	-0.062***	1		
F. ROA	0.290***	-0.032*	-0.333***	0.208***	0.129***	1	
G. RETURN	0.049***	0.011	-0.056***	-0.000	0.030*	0.129***	1
H. VOL	0.433***	0.097***	-0.425***	-0.227***	0.175***	0.063***	0.066***

*, **, *** indicate significance at the 10%, 5%, and 1% levels, respectively (two-tailed test).

The coefficient on LEV is a negative and significant (p<0.01), suggesting that highly leveraged firms are more likely to be subject to financial distress. In addition, the estimated sign of each control variable, except for stock return volatility, is mostly consistent with that of previous studies.

Table 3.   Basic regression results

Variables	Dependent variable = DISTANCE		
	Coefficient	t-value	p-value
INSURANCE	1.7083	2.97	0.003
LEV	-2.427	-24.88	0.000
SIZE	0.0274	2.37	0.018
CASH	5.3109	15.29	0.000
ROA	1.2690	5.98	0.000
RETURN	0.1962	2.62	0.009
VOL	0.0208	17.34	0.000
Intercept	1.9665	6.43	0.000
Industry Dummy	Yes		
Year Dummy	Yes		
Adjusted R^2	0.540		
Number of obs.	3,080		

Furthermore, as a robustness check, this study runs a regression equation using a dependent variable, Z-Score. Table 4 reports the results of the pooled OLS regression. Consistent with the finding in Table 3, the coefficient on INSURANCE is positive and significant (p<0.01). This finding indicates that firms with a higher extent of property-liability insurance use are less likely to face financial distress. The main result is robust to an alternative proxy for financial distress, Z-Score. In addition, the signs of coefficients on control variables, except for VOL, are consistent with the predictions.

Table 4.   Regression results: Z-score model

Variables	Dependent variable = Z-Score		
	Coefficient	t-value	p-value
INSURANCE	9.4847	4.81	0.000
LEV	-4.3971	-22.42	0.000
SIZE	0.1080	4.99	0.000
CASH	3.4329	5.66	0.000
ROA	7.8198	17.46	0.000
RETURN	0.0425	0.29	0.774
VOL	0.0312	12.18	0.000
Intercept	0.1950	0.34	0.738
Industry Dummy	Yes		
Year Dummy	Yes		
Adjusted R^2	0.533		
Number of obs.	3,080		

Finally, this study re-estimates the analysis using the fixed effects panel regression. The regression has advantage of obtaining a consistent estimator even though there is bias due to omitted variables. The results of the fixed effects panel regression using a dependent variable, DISTANCE are presented in Table 5. As expected, the coefficient on INSURANCE is positively significant (p<0.1). The result supports the central hypothesis.

Table 5.   Firm fixed-effects panel regression results

Variables	Dependent variable = DISTANCE		
	Coefficient	t-value	p-value
INSURANCE	1.3501	1.93	0.054
LEV	-0.6672	-3.50	0.000
SIZE	-0.0855	-1.52	0.129
CASH	2.8503	7.34	0.000
ROA	0.7079	3.21	0.001
RETURN	0.3452	5.44	0.000
VOL	0.0151	10.86	0.000
Intercept	4.2449	2.91	0.004
Industry Dummy	No		
Year Dummy	Yes		
Adjusted	0.737		
Number of obs.	3,080		

5. References

1. Magee S. The effect of foreign currency hedging on the probability of financial distress. Accounting and Finance. 2013 Dec; 53(4):1107–27.
2. Nelson JM, Moffitt JS, Affleck-Graves J. The impact of hedging on the market value of equity. Journal of Corporate Finance. 2005 Oct ; 11(5):851–81.
3. Regan L, Hur Y. On the corporate demand for insurance: The case of Korean nonfinancial firms. Journal of Risk and Insurance. 2007 Dec; 74(4):829–50.
4. Adams MB, Hardwick P, Zou H. Reinsurance and corporate taxation in the United Kingdom life insurance industry. Journal of Banking and Finance. 2008 Jan; 32(1):101–15.
5. Modigliani F, Miller M. The cost of capital, corporate finance and the theory of investment. American Economic Review. 1958 Jun; 48(3):261–97.
6. Froot K, Scharfstein D, Stein J. Risk management: Coordinating investment and financing policies. Journal of Finance. 1993 Dec; 48:1629–58.
7. Leland HE. Agency costs, risk management, and capital structure. Journal of Finance. 1998 Aug; 53(4):1213–43.
8. Ross MP. Corporate hedging: What, why, and how? University of California, Berkeley: Working paper; 1997.

9. Smith CW, Stulz R. The determinants of firms hedging policies. Journal of Financial and Quantitative Analysis. 1985 Dec; 20(4):391–405.
10. Stulz RM. Rethinking risk management. Journal of Applied Corporate Finance. 1996; 9(3):8–25.
11. Mayers D, Smith CW. On the corporate demand for insurance. Journal of Business. 1982 Apr; 55(2):281–96.
12. Berkman H, Bradbury ME. Empirical evidence on the corporate use of derivatives. Financial Management. 1996 Jan; 25(2):5–13.
13. Gay GD, Nam J. The underinvestment problem and corporate derivatives use. Financial Management. 1998 Feb; 27(2):1–6.
14. Graham JR, Rogers DA. Do firms hedge in response to tax incentives? Journal of Finance. 2002 Apr; 57(2):815–39.
15. Knopf JD, Nam J, Thornton JH. The volatility and price sensitivities of managerial stock option portfolios and corporate hedging. Journal of Finance. 2002 Apr; 57(2):801–13.
16. Tufano P. Who manages risk? An empirical examination of risk management practices in the gold mining industry. Journal of Finance. 1996 Sep; 51(4):1097–137.
17. Merton RC. On the pricing of corporate debt the risk structure of interest rates. Journal of Finance. 1974 May; 29(2):449–70.
18. Altman EI. Financial ratios, discriminant analysis and the prediction of corporate bankruptcy. Journal of Finance. 1968 Sep; 23(4):589–609.
19. Campbell JY, Hilscher J, Szilagyi J. In search of distress risk. Journal of Finance. 2008 Nov; 63(6):2899–939.
20. Shumway T. Forecasting bankruptcy more accurately: A simple hazard model. Journal of Business. 2001 Jan; 74(1):101–24.