Indian Journal of Economics and Business

Vol. 20 No. 3 (Special Issue, 2021)

http://www.ashwinanokha.com/IJEB.php

Is Bigger Better? Firms size Implication of Corporate Governance Risk Management with the Financial Derivatives

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Abstract

The extant literature is divided regarding the impacts of firm size on financial derivatives. In this regard, empirical studies provide conflicting results and offer opposing viewpoints indicating the need for investigation. In this study, we examine whether firm size affects the impacts of corporate governance on risk management of financial derivatives. The results suggest that the corporate governance manages risk consistently in respect of financial derivatives irrespective of the size of the firm and leads to the conclusion that firm size does not impact the risk behavior of corporate governance. The methodology in this study departs from the prevalent derivatives literature where derivative-user and non-user firms are compared to determine the differences in firm characteristics. We segregate our sample into larger and smaller firms to examine firm size effects on corporate governance risk management behaviour. Further, we use the simultaneous equations technique to incorporate the simultaneity of hedging and leveraging in the firm's capital structure decisions. It is the first study to investigate the firm size impacts of corporate governance on financial derivatives and provides new insights on governance risk management behavior.

Key words: Corporate governance, financial derivatives, risk management.

1. Introduction

There are mainly two theories that underlie discussions regarding the effects of firm size on the firm's derivatives usage decisions: the larger resources viewpoint and the higher financial distress perspective. The first theory suggests that larger firms have the resources and expertise to put in place effective risk management programs and larger cash outlay to support this. These larger firms should be able to effectively use derivatives to enhance firm value and so these researchers suggest that there should be evidence of the greater use of derivatives in larger sized firms. Thereby, suggesting a positive relationship between firm size and derivatives usage.

The second theory indicates that there is a negative relationship of firm size with derivatives. These theorists support the view that since larger firms have easier access to external financing and the resources to pay off debts, they have lower financial and bankruptcy risks. In fact, smaller firms comparatively carry a higher debt burden, larger financial costs and higher creditor claims on assets. Therefore, they are faced with potentially higher financial distress and bankruptcy costs and so would exhibit a greater need for hedging with derivatives. Therefore, we should expect to see a negative association between firm size and derivatives for smaller firms. With this dichotomy between size and extent of derivatives usage, it becomes necessary to examine whether similar variations are observed and whether corporate governance impacts on financial derivatives vary with firm size.

Unlike previous studies related to financial derivatives, we do not examine the impacts of firm size differences between derivative users and non-user firms as we are not interested in studying the impacts

of firm size on derivatives. Rather we examine whether firm size would make a difference to corporate governance risk management impacts on financial derivatives and hence our focus is mainly on the firm size differences. This is an area that has not been explored in the literature and it makes important contributions in understanding corporate governance risk management behavior in respect of financial derivatives.

This research does not find any differences in the impacts of corporate governance on derivative usage due to firm size effects. The consistent behavior shows that corporate governance is not influenced by firm size and considers both larger and smaller firms alike in execution of their derivatives risk management strategies and control. Therefore, we conclude that corporate governance performs consistently irrespective of the size of the firm and provides the same level of monitoring of derivatives usage in firms of all sizes.

2. Literature Review

Hedging can decrease financial distress costs by reducing the risk-taking behavior of stock holders against the bondholders (Mayers and Smith, 1987; Bessembinder, 1991). In this regard Nance et al., (1993) suggest that the motive to hedge should be studied from two aspects: 1) the financial distress costs if it does not hedge and 2) the costs if the firm eventually incurs financial distress costs. They showed that the size of the firm's fixed amount of claims was an important consideration in bankruptcy and therefore size of the firm is important in the hedging decision.

Some researchers examine the relationship of firm size with derivatives and find a positive relationship to indicate that larger firms are more likely to use derivatives (Bartram, Brown & Fehle, 2009; Guay & Kothari, 2003). Dolde (1993) suggests that this is because larger firms have more in-house investment which enables them to set up a risk management program and others (Booth, Smith and Stolz, 1984; Block & Gallagher,

1986) add that larger firms would have the resources to put a hedging program in place, therefore larger firms are more likely to hedge. Since the larger firms would be able to better bear the costs of hedging as compared to smaller firms, thus larger firms would have more incentive to hedge.

Mian (1996) uses size to test the financial distress hypothesis but finds that the association between hedging and size cannot be determined. Although he does find a positive relation between size and hedging, he attributes it more to economies of scale than financial distress costs. Warner (1977) suggests that the costs of financial distress are not related to the size of the firm and for the large firms these costs are small compared to the firm's assets, while Ang et al. (1982) contend it does not follow that a firm's financial distress costs increase with the increase in the firm's size. In fact, the financial distress costs would be more for smaller firms compared to the larger firms, since smaller firms have comparatively larger fixed claims and more bankruptcy risk and so would have a greater motivation to hedge (Nance et al., 1993). Smith and Stulz (1985) in a discussion of how hedging lowers the variability of future value of the firm thereby minimizing the chances of the firm going bankrupt, show that smaller firms with higher bankruptcy costs have a higher tendency to hedge than the larger firms.

Some (Gay and Nam, 1998, Haushalter, 2000) do not obtain any statistically significant results. Ramlall (2010) points out that this lack of supporting evidence emanates primarily from two reasons: smaller firms are more prone to hedge as they have higher financial distress costs so that there is a negative relationship of size with leveraging and hedging and also smaller firms have a progressive tax structure motivating them to hedge more. Thus, there are conflicting results regarding the relationship of firm size with financial derivatives.

3. Research Sample, Data and Methodology

For this study, we derive a sample of non-financial firms listed on the New York Stock Exchange (NYSE) for a period of eight years spanning 2004 to 2011. The data has been derived from several databases: Bloomberg, WRDS Corporate Library, Direct Edgar and WRDS Compustat. Large number of data is missing in respect to corporate governance; therefore the reduced final sample is reduced to an unbalanced panel of firms, with the lowest number of 174 firms in 2004 and the highest of 1606 firms in 2009, comprising a total sample of 6900 firm year observations.

The measures and definition of all dependent and independent variables are provided in Appendix 1. The derivatives measures have been derived from the 10-K proxy filings of US firms for the eight-year period and extracted through SEC Direct Edgar by using search words for derivatives, swaps, options, futures, etc, with wild cards* to extract a larger word search. Subsequently, the final derivatives data sample is compiled manually by reading each search word (from the millions of data lines extracted) to ensure it relates to derivatives usage by the firm and not the mere mention of a derivatives instrument. The thirteen corporate governance variables are obtained from the Corporate Library database and relate to board of directors: board size, board diversity, board independence and board meetings; audit committee: audit committee size which would also capture the impacts of audit committee vigilance and expertise (Dhaliwal et al., 2006); shareholders: institutional shareholders, block shareholders and insider shareholders; and CEO: base salary, bonus, total compensation, age and tenure. Data on the firm characteristics are obtained from Bloomberg and Compustat databases.

3.1 Hypothesis Development

There is a natural inclination for corporate governance to be more vigilant in larger firms since the more renowned and bigger firms have higher visibility and influence in the markets and stock exchanges. Thus, they would have a greater impact on the director's reputation. If directors view larger firms that have more

diversified operations, products, business segments as having more resources to hedge risk and lower costs of hedging, then it would follow that they would avidly put in place hedging programs. The hedging activities would provide positive market signals, lower market information asymmetry, convey better risk management activities, thereby enhancing their reputation in the markets. This would be in line with researchers (Bartram et al., 2009; Guay & Kothari, 2003; Dolde, 1993; Booth et al., 1984; Block & Gallagher, 1986) who end support to the larger-size larger-resources viewpoint, and we should expect to see a significant positive influence of firm size on corporate governance-derivative usage relationship. On the other hand, the financial distress theorists (Ang et al., 1982; Nance, et al., 1993; Smith and Stulz, 1985) suggest that there is a negative relationship where smaller firms would have comparatively more financial distress and bankruptcy risk as their fixed claims payments would be larger in proportion to their assets base, and therefore would hedge more. If this is true then we would expect that corporate governance in smaller firms would more extensively employ hedging and we expect to find a negative relationship between corporate governance risk management and firm size impacts. Overall literature indicates that firm size is a determinant of a firm's hedging activities, though there exists a conflict in the predicted direction of the relationship.

As a result, we do not predict the directional impact of firm size on the effects of corporate governance on financial derivatives hedging decisions of the firm. And, our study addresses the research question whether firm size differences impact the relationship of corporate governance and derivatives within the firm. Therefore, the hypothesis of the study may be stated in the null and alternate forms respectively, as:

H_0: Firm size has no impact on corporate governance risk management of financial derivatives in the firm.

H_A: Firm size has a significant impact on corporate governance risk management of financial derivatives in the firm.

And we use the following simultaneous equation to test our hypotheses:

$$\boldsymbol{LEVERAGE}_{\boldsymbol{i,t}}^{\boldsymbol{a}} = b_0 + b_1\boldsymbol{DER}_{\boldsymbol{i,t}}^{\boldsymbol{b}} + b_2 R\&D_{i,t} + b_3 ROA_{i,t} + b_4 SIZE_{i,t} + b_5 VOL_{i,t} + \beta_{i,t}$$

$$\begin{aligned}\boldsymbol{DER}_{\boldsymbol{i,t}}^{\boldsymbol{b}} = {} & c_0 + c_1 BDMTGS_{i,t} + c_2 BDSIZE_{i,t} + c_3 BDINDEP_{i,t} + c_4 BDDIVERS_{i,t} \\ & + c_5 SHINSIDER_{i,t} + c_6 SHINST_{i,t} + c_7 SHBLOCK_{i,t} + c_8 CEOAGE_{i,t} \\ & + c_9 CEOTENURE_{i,t} + c_{10} CEOCOMP_{i,t} + c_{11} CEOBONUS_{i,t} \\ & + c_{12} CEOSALARY_{i,t} + c_{13} ACSIZE_{i,t} + \boldsymbol{c_{14}}\boldsymbol{LEVERAGE}_{\boldsymbol{i,t}}^{\boldsymbol{a}} + c_{15} SIZE_{i,t} \\ & + c_{16} R\&D_{i,t} + c_{17} TLCF_{i,t} + c_{18} LIQUIDITY_{i,t} + \gamma_{i,t}\end{aligned}$$

where variable definitions are provided in Appendix 1.

3.2. Research Methodology

In any examination of financial derivatives, there exists a problem of simultaneity between leverage and derivatives, as firms take both debt and financial derivatives into consideration in fulfilling their financial requirements. Firms may prefer debt financing or financial hedging or a mixture of both. Therefore, leverage and hedging may act as substitute/complement for each other to fulfill the financing needs of the firm. An examination of one without the other would give unrealistic and incorrect results and therefore any examination of a firm's hedging activities must also take into consideration the simultaneous effect of leverage decisions. We apply Maddala (1983) simultaneous equations model to examine the relationship of firm size with governance risk management impacts and use the model specifications as suggested by the author. For the analyses, we employ the CSDIMEQ simultaneous equations model developed by Keshk (2003) which is particularly suited for this model, where one endogenous variable as dichotomous (as in derivatives use) and the other is a continuous variable (as in debt). Therefore, in our models we use simultaneous equations regression with debt (LEVERAGE) and derivatives (DER) as the endogenous dependent variables in the two equations.

To test for effects of differences in firm size, we divide our sample into two groups for larger and smaller sized firms. Purnanandam (2004; 2008) suggests that despite the control for effects of size, the pooled regression analysis for all firms may hide the hedging behavior of large and small firms if they have significant different characteristics and hedging motivations. In the manner of Purnanandam (2004; 2008), we divide the full sample into two groups based on whether the firm size, taken as total assets, is above or below the sample median. Subsequently, we examine the impacts of corporate governance on derivatives in both the larger and smaller firms' groups. We use the simultaneous equations model in all the tests to ensure that the simultaneous impacts of debt and derivatives are considered in order to achieve more robust and accurate results.

4. Results

4.1 Univariate Results

Table 1 presents the descriptive statistics for the variables examined in this study. It reports the mean values of derivatives, where derivatives are measured as a binary variable indicating 1 if a firm uses derivatives and 0 otherwise. This information is provided across industries and across years for the sample period from 2004 to 2011. In general, the mean value for derivatives does not vary greatly between the years for any one industry. Similarly, the average means for each industry are not very different, except for the manufacturing and service provider industries.

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Table 1: Description of Derivative Users by Industry and Year

	Derivatives Users (DER) Mean Values								
	2004	2005	2006	2007	2008	2009	2010	2011	Total Period
Agriculture, Forestry & Fishing	0.000	0.003	0.003	0.018	0.000	0.001	0.002	0.005	0.004
Mining, Oil &Gas	0.018	0.066	0.074	0.009	0.083	0.072	0.056	0.108	0.061
Utilities	0.080	0.083	0.063	0.045	0.078	0.065	0.052	0.079	0.068
Construction	0.036	0.020	0.011	0.009	0.013	0.016	0.010	0.012	0.016
Manufacturing	0.509	0.508	0.510	0.554	0.478	0.498	0.544	0.455	0.507
Service Provider	0.080	0.130	0.129	0.125	0.117	0.119	0.138	0.106	0.118
Information	0.071	0.070	0.088	0.098	0.076	0.080	0.060	0.074	0.077
Real Estate	0.000	0.010	0.003	0.018	0.009	0.007	0.006	0.010	0.008
Professional Business & Other Services	0.134	0.070	0.072	0.098	0.088	0.090	0.087	0.098	0.092
Education & Health	0.063	0.013	0.008	0.009	0.022	0.022	0.017	0.029	0.023
Leisure & Hospitality	0.009	0.027	0.039	0.018	0.036	0.029	0.029	0.025	0.027

Note: The sample comprising an uneven panel of firms consists of a total of 6900 observations, of which 3183 pertain to firms using derivatives. Derivatives (DER) is measured as a binary variable, and extracted from SEC 10-K proxy statements through Direct Edgar. Companies are categorized based on the North American Industry Classification System (NAICS) and listed on the New York Stock Exchange (NYSE) over the period 2004 – 2011.

Across industries, the table shows that on average, the manufacturing sector has the highest derivatives while the agriculture, fishing and forestry sector has the lowest derivatives during the sample period. Overall the highest industry mean value of DER is recorded at 0.507, with the lowest overall mean at 0.004. The highest mean has been achieved in 2007 and the lowest in 2004 and 2008.

In respect of derivative user firms, the industry-wise breakdown based on the North American Industry Classification System (NAICS) as provided in Table 2. The table shows that generally non-users and user firms have similar distributions within an industry. The proportion of derivative users are lower than derivative non-user firms in all sectors, other than for mining, oil and gas, and utilities sectors where they are marginally higher, while derivative non-user firms are proportionally much higher in the services sectors. In the total sample, the percentage of derivative user firms is 46.13%. The descriptive statistics for the sample is presented in Table 3 and provides the 1st, 2nd, 3rd percentile statistics along with minimum, maximum and standard deviation data for each variable used in the sample and the definitions of each variable is provided in Appendix 1.

Table 2: Sample Percentage of Derivative User Firms Under Each Industry Category

INDUSTRIES	PERCENTAGE OF DERIVATIVE USER FIRMS
Agriculture, Forestry & Fishing	33.33
Mining, Oil &Gas	56.30
Utilities	58.49
Construction	37.19
Manufacturing	48.72
Service Provider	41.77
Information	40.82
Real Estate	34.29
Professional Business & Other Services	38.36
Education & Health	36.26
Leisure & Hospitality	44.55
Total (# of firms)	6900

Note: The sample covered a total of 6900 observations, comprising an uneven panel of firms. Derivatives (DER) is measured as a binary variable, and extracted from SEC 10-K proxy statements through Direct Edgar. Companies are categorized based on the North American Industry Classification System (NAICS) and listed on the New York Stock Exchange (NYSE) over the period 2004 – 2011.

Table 3 Descriptive Statistics: Derivatives, Leverage and Corporate Governance

Variables	N	Mean	Median	Standard Deviation	Minimum	Percentiles 25	Percentiles 75	Maximum
Panel A: Dependent variables								
DER	6900	0.461	0.000	0.499	0.000	0.000	1.000	1.000
LEVERAGE	6900	0.205	0.148	0.208	0.000	0.019	0.323	0.980
Panel B: Corporate Governance variables								
BDMTGS	6900	8.007	7.000	3.699	1.000	6.000	9.000	46.000
BDSIZE	6900	8.815	9.000	2.129	4.000	7.000	10.000	17.000
BDINDEP	6900	6.411	6.000	2.156	1.000	5.000	8.000	16.000
BDDIVERS	6900	0.981	1.000	0.980	0.000	0.000	2.000	6.000
CEOAGE	6900	55.263	55.000	7.323	30.000	50.000	60.000	89.000
CEOTENURE	6900	8.683	7.000	7.527	1.000	3.000	12.000	54.000
SHINSIDER	6900	0.137	0.055	0.191	0.000	0.024	0.161	0.963
SHINST	6900	0.675	1.000	0.468	0.000	0.000	1.000	1.000
SHBLOCK	6900	0.236	0.213	0.164	0.000	0.115	0.330	0.979
ACSIZE	6900	5.111	5.000	2.181	1.000	3.000	6.000	16.000
CEOCOMP	6900	14.060	14.023	1.181	2.303	13.440	14.741	18.794
CEOBONUS	6900	5.080	0.000	6.374	0.000	0.000	12.612	18.159
CEOSALARY	6900	13.337	13.383	0.753	2.303	13.037	13.722	16.194
Panel C: Control variables								
TLCF	6900	0.617	1.000	0.486	0.000	0.000	1.000	1.000
LIQUIDITY	6900	0.205	0.188	0.875	-4.083	-0.303	0.716	4.210
ROA	6900	1.322	2.245	2.333	-6.293	0.759	2.875	5.581
SIZE	6900	7.041	7.057	1.862	-3.912	5.967	8.216	12.980
VOL	6900	3.803	3.800	0.472	2.427	3.487	4.114	5.640
R&D	6900	0.497	0.000	0.500	0.000	0.000	1.000	1.000
LEVERAGE	6900	0.205	0.148	0.208	0.000	0.019	0.323	0.980

Note: The sample covers a total of 6900 observations, comprising an uneven panel of firms. Derivatives (DER) is measured as a binary variable, and extracted from SEC 10-K proxy statements through Direct Edgar. Companies are categorized based on the North American Industry Classification System (NAICS) and listed on the New York Stock Exchange (NYSE) over the period 2004 – 2011. Variable descriptions are provided in Appendix 1.

4.2 Multivariate Results (Full Sample)

The simultaneous equations regression results for the full sample are presented in Table 4. Columns 2 and 3 show results for the debt tests with leverage as the dependent variable and derivatives (DER) have a significant positive association with debt (LEVERAGE) at the 1% level with a t-statistics of 9.29. The positive and significant relationship is consistent with literature

(Graham and Rogers, 2002; Lin and Smith, 2007) and supports the contention that an increase in leverage would increase the need to hedge with derivatives to reduce financial constraints and increase debt capacity. All the control variables for the leverage equation (Column 2) are statistically significant at the 1% level and in the directions of literature. Increased profitability (ROA) reduces the need for debt financing; greater operational and business activities (SALES) require larger debt financing; higher volatility increases risk and debt; investment growth opportunities have a negative relationship with leverage. The first model utilizes the ordinary least squares (OLS) technique and shows a comparatively high R^2 of 35% which is larger than achieved by Borokhovich et al. (2004) for their models which ranges from 16.7% to 25.2%, who use a simultaneous equations model and US sample.

Columns 4 and 5 of Table 4, show results of the derivatives (DER) equation, and here all control variables are significant and in line with theory. All the determinants of derivatives: financial distress (LEVERAGE), investment growth opportunities (R&D), and liquidity (LIQUIDITY). However, tax convexity, captured through a dichotomous variable as 1 for tax loss carry forward (TLCF) and otherwise 0, is not significant. Fok et al. (1997) use a similar measure to capture tax convexity and do not find any significant results for the two different proxies used. The DER Model (columns 4 and 5) show a prob>chi2 as 0.000. This indicates the hypothesis that all coefficients are equal to zero is rejected at the 1% significance level and supports the fitness of the model.

Table 4: Simultaneous Equations Model for The Relationship between Derivatives, Leverage and Corporate Governance (full sample)

$$\boldsymbol{LEVERAGE}^{\boldsymbol{a}}_{\boldsymbol{i,t}} = b_0 + b_1 DER^{b}_{i,t} + b_2 R\&D_{i,t} + b_3 ROA_{i,t} + b_4 SIZE_{i,t} + b_5 VOL_{i,t} + \beta_{i,t}$$

$$\boldsymbol{DER}^{\boldsymbol{b}}_{\boldsymbol{i,t}} = c_0 + c_1 BDMTGS_{i,t} + c_2 BDSIZE_{i,t} + c_3 BDINDEP_{i,t} + c_4 BDDIVERS_{i,t} + c_5 SHINSIDER_{i,t} + c_6 SHINST_{i,t} + c_7 SHBLOCK_{i,t} + c_8 CEOAGE_{i,t} + c_9 CEOTENURE_{i,t} + c_{10} CEOCOMP_{i,t} + c_{11} CEOBONUS_{i,t} + c_{12} CEOSALARY_{i,t} + c_{13} ACSIZE_{i,t} + c_{14} LEVERAGE^{a}_{i,t} + c_{15} SIZE_{i,t} + c_{16} R\&D_{i,t} + c_{17} TLCF_{i,t} + c_{18} LIQUIDITY_{i,t} + \gamma_{i,t}$$

	LEVERAGE		DERIVATIVES	
VARIABLE	**coefficient**	**t-stat**	**coefficient**	**z-stat**
DER[b]	0.17***	9.29		
	(0.018)			
ROA	-0.03***	-16.22		
	(0.002)			
SALES	0.02***	5.25		
	(0.004)			
VOL	0.09***	9.98		
	(0.009)			
R&D	-0.11***	-16.67	0.15***	3.95
	(0.006)		(0.037)	
BDMTGS			-0.000	-0.08
			(0.004)	
BDSIZE			0.03**	2.16
			(0.013)	
BDINDEP			-0.02	-1.34
			(0.014)	
BDDIVERS			-0.02	-1.23
			(0.019)	
SHINSIDER			-0.42***	-4.09
			(0.102)	
SHINST			0.11***	3.09
			(0.035)	
SHBLOCK			-0.09	-0.79
			(0.110)	
CEOAGE			0.004*	1.71
			(0.002)	
CEOTENURE			0.000	0.13
			(0.002)	
CEOCOMP			-0.06***	-3.24
			(0.020)	
CEOBONUS			0.01***	3.18
			(0.003)	
CEOSALARY			0.10***	3.21
			(0.031)	
ACSIZE			-0.01	-1.16
			(0.009)	
LEVERAGE[a]			0.59**	2.56

	LEVERAGE		DERIVATIVES	
VARIABLE	**coefficient**	**t-stat**	**coefficient**	***z*-stat**
			(0.230)	
SALES			0.11***	8.61
			(0.013)	
TLCF			-0.02	-0.62
			(0.032)	
LIQUIDITY			-0.12***	-4.41
			(0.026)	
Constant	-0.16***	-3.17	-1.81***	-5.31
	(0.050)		(0.341)	
Year effects	yes		yes	
Industry effects	yes		yes	
Observations	6900		6900	
R^2 / *Pseudo* R^2	0.35		0.05	

[a, b] denote the predicted value from the other equation. The p-value is indicated as ***, **, * to show statistical significance at the 0.01, 0.05 and 0.10 levels respectively, and robust standard errors are given in parentheses. The t and z values are also provided. See Appendix 1 for definitions of dependent and independent variables.

Only seven out of the thirteen corporate governance variables are found to be associated with derivatives. Board size is found to be positively related with derivatives at 5% level of significance. BDSIZE captures the effects of board influence and involvement in the risk management decisions of the firm and the result indicates that larger boards increase derivatives. The results for the other board characteristics – independence, diversity and meetings, do not indicate any significant influence on derivatives.

The results show that shareholders are actively involved in risk management of the firm. However, insider shareholding (SHINSIDER) by management and directors show a -0.42 coefficient, indicating a negative association with derivatives at 1% level of significance. The coefficient for institutional shareholders (SHINST) is positive and significant at the 1% level. This is line with Allayannis et al. (2012) who obtain a positive relationship between institutional shareholders and derivatives and they attribute this to strong governance.

CEO age (CEOAGE) captures the effects of CEO short-term problems. The result shows a positive association with derivatives, it is weakly significant at the 10% level of significance. This indicates that older CEOs increase derivatives. The results for CEO total compensation (CEOCOMP) is negative and statistically significant at 1% level indicating that total CEO compensation tends to reduce the extent of derivatives. This is in keeping with the literature which indicates that stock options tend to cause CEOs to increase risk and volatility in order to derive gains in their options portfolios. The other components for CEO base salary (CEOSALARY) and cash bonus (CEOBONUS) show positive coefficients that are statistically significant at the 1% level. The other coefficients for corporate governance variables, audit committee size (ACSIZE), blockholders (SHBLOCK) and CEO tenure (CEOTENURE) are not significant ($p>0.10$), providing no evidence for the existence of associations between these variables and risk management through increased derivatives.

4.3 Multivariate Results (Split Samples)

Subsequently, we split the sample into two groups: larger sized firms and smaller sized firms based on whether the firms are larger than the median firm size or smaller than the median, in the manner of Purnanandam (2004; 2008). The results for these groups are provided in Table 5. Both the regression tests use the same simultaneous equations methodology and variables as depicted in Table 4. Due to space constraints, we do not include the first stage equations for the leverage models, which are available with the authors, however the direction and significance of the coefficients are similar to those derived in Table 4 for the first stage leverage models.

The results for corporate governance variables are largely similar between the two groups and in keeping with the findings for the full sample (Table 4). There is only a difference in the results

for board size, i.e. board size is insignificant for larger firms but shows significant results in smaller firms. This indicates that larger boards are more effective in the smaller sized firms, but may not have an impact when firms are big and therefore comparatively boards get larger.

Regarding the control variables, there are some differences in the results for the two groups. This is expected since the controls capture firm characteristics. Both groups support the theories of investment growth opportunities related to hedging activities (R&D). These findings are consistent with the underinvestment cost model of Froot et al. (1993). The large-firm sample provides evidence in support of the underinvestment cost theories (*FINCONSTR1)* and financial distress theories (*LEVERAGE)* of hedging. On the other hand, the hedging behavior of small firms is explained primarily by economies of scale (SALES). Also, it appears that smaller firms use short term financing (LIQUIDITY) as a substitute for hedging which is evidenced through the negative sign on the quick ratio and that is significant at 1 % level.

5. Discussion & Conclusion

The results show that corporate governance is not influenced by the size of the firm and that their risk attitude does not change in respect of financial derivatives. It leads to the conclusion that corporate governance provides consistent risk management and control over financial derivatives irrespective of size. This is counter-intuitive to the results obtained for firm characteristics which indicates major differences for smaller and larger firms, in respect of financial distress, short term financing, economies of scale and underinvestment costs related to hedging activities of the firm.

Board Meetings (BDMTGS), board independence (BDINDEP), board diversity (BDDIVERS), block shareholders (SHBLOCK), CEO age and CEO tenure, and audit

committee size (ACSIZE) do not have any impacts on the derivatives hedging decisions of the firm in both groups of firms. While insider shareholders (SHINSIDER) and total CEO compensation (CEOCOMP) reduce the extent of derivatives use in firms. Institutional shareholders (SHINST), CEO base salary (CEOSALARY) and CEO bonus (CEOBONUS) induce the increased use of financial derivatives hedging activities by the firm. The increase or decrease of derivatives may have a value enhancing or risk reducing impact and may contribute to the effective hedging activities of the firm. This study does not examine corporate governance hedging effectiveness but the findings supports the contention that corporate governance in firms is not influenced by any size effects. Governance exhibits consistent risk management over financial derivatives usage in firms, to show the disregard for any personal advantages or for personal gain. It provides evidence of corporate governance consistent monitoring and control over derivatives hedging activities in firms whether large or small.

Table 5: Firm Size Effect of Derivatives and Corporate Governance (Split Sample)

$$\boldsymbol{LEVERAGE}^{\boldsymbol{a}}_{\boldsymbol{i,t}} = b_0 + b_1 DER^{b}_{i,t} + b_2 R\&D_{i,t} + b_3 ROA_{i,t} + b_4 SIZE_{i,t} + b_5 VOL_{i,t} + \beta_{i,t}$$

$$\begin{aligned}\boldsymbol{DER}^{\boldsymbol{b}}_{\boldsymbol{i,t}} = {} & c_0 + c_1 BDMTGS_{i,t} + c_2 BDSIZE_{i,t} + c_3 BDINDEP_{i,t} + c_4 BDDIVERS_{i,t} + c_5 SHINSIDER_{i,t} + c_6 SHINST_{i,t} \\ & + c_7 SHBLOCK_{i,t} + c_8 CEOAGE_{i,t} + c_9 CEOTENURE_{i,t} + c_{10} CEOCOMP_{i,t} + c_{11} CEOBONUS_{i,t} \\ & + c_{12} CEOSALARY_{i,t} + c_{13} ACSIZE_{i,t} + c_{14} LEVERAGE^{a}_{i,t} + c_{15} SALES_{i,t} + c_{16} R\&D_{i,t} + c_{17} TLCF_{i,t} \\ & + c_{18} LIQUIDITY_{i,t} + c_{18} FINCONSTR1_{i,t} + \gamma_{i,t}\end{aligned}$$

	TOTALASSETS>median DER		TOTALASSETS<median DER	
Variable	Coeff	*z*-stat	coeff	*z*-stat
R&D	0.17***	3.25	0.20***	3.74
	(0.053)		(0.053)	
BDMTGS	0.00	0.11	-0.000	-0.43
	(0.007)		(0.006)	
BDSIZE	0.02	0.93	0.04**	2.12
	(0.02)		(0.021)	
BDINDEP	-0.01	-0.55	-0.03	-1.21
	(0.018)		(0.022)	
BDDIVERS	0.02	-0.84	-0.00	0.01
	(0.026)		(0.031)	
SHINSIDER	-0.35**	-2.34	-0.52***	-3.55
	(0.151)		(0.147)	
SHINST	0.11**	2.09	0.13***	2.72
	(0.05)		(0.047)	
SHBLOCK	-0.20	-1.23	-0.17	-1.11
	(0.164)		(0.155)	
CEOAGE	0.00	0.84	0.005	1.63
	(0.003)		(0.003)	
CEOTENURE	0.00	0.15	0.000	0.08
	(0.003)		(0.003)	
CEOCOMP	-0.08***	-2.97	-0.06**	-3.24
	(0.026)		(0.020)	
CEOBONUS	0.01***	2.86	0.01**	2.26

	TOTALASSETS>median DER		TOTALASSETS<median DER	
Variable	**Coeff**	***z*-stat**	**coeff**	***z*-stat**
	(0.004)		(0.004)	
CEOSALARY	0.10***	2.68	0.12*	1.88
	(0.036)		(0.064)	
ACSIZE	0.011	-0.96	-0.00	-0.24
	(0.012)		(0.015)	
LEVERAGE[a]	0.54*	1.88	0.71	1.51
	(0.289)		(0.472)	
SALES	-0.01	-0.39	0.14***	6.46
	(0.022)		(0.021)	
TLCF	0.02	0.33	-0.06	-1.36
	(0.047)		(0.047)	
LIQUIDITY	0.036	0.96	-0.14***	-4.18
	(0.038)		(0.034)	
FINCONSTR1	0.14*	1.76	0.11	0.80
	(0.080)		0.136	
Constant	-0.53	-1.26	-2.36***	-3.20
	(0.421)		(0.737)	
Year effects	Yes		yes	
Industry effects	Yes		yes	
Observations	3451		3449	
Pseudo R^2	0.02		0.05	

DER stands for derivatives and is the dependent variable in both the equations. [b] denotes the predicted value of leverage derived from the other equation. The first stage equation for Leverage has not been presented here due to space constraints. The p-values are indicated as ***, **, * to show statistical significance at the 0.01, 0.05 and 0.10 levels respectively, and robust standard errors are given in parentheses. The t and z values are also provided. See Appendix 1, for definitions of the dependent and independent variables.

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