FINANCE INDIA
Vol. XVIII Special Issue, April-May 2004
Pages – 703-721

An Empirical Investigation of Corporate Risk-taking in Financial Distress

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Abstract

It is often argued that debt financing provides shareholders with an incentive to shift to high-risk projects as it enables them to expropriate wealth from creditors. This conflict of interests between shareholders and creditors has been acknowledged as a serious impediment to debt financing. This paper re-examines the debt-induced risk-taking incentive using two size and industry-matched samples of financially distressed and healthy firms. While financially distressed firms are more leveraged, the level of risk-taking is similar across the two samples. Further investigations show that risk-taking in financial distress is mitigated by managerial and block ownership, the extent of hedging, tax function convexity, growth opportunities and size. Overall, the results suggest that excessive risk-taking may not account for the observed low debt ratios since high leverage creates countervailing incentives to reduce risk.

I. Introduction

SEVERAL DECADES AFTER Modigliani and Miller (1958) put forward their irrelevance theorem, and despite extensive research thereof, the explanation of the observed corporate financing choices remains among the hottest topics in the financial economics literature. The crux of the story is that firms around the world are using relatively modest amounts of debt in their capital structures (Rajan and Zingales, 1995; Booth et al., 2001), losing therefore the opportunity to deduct interest expenses and to pay lower taxes. To explain this puzzle, the literature identified numerous impediments to debt financing such as financial distress costs, bankruptcy costs, conflicts between shareholders and managers, and conflicts between shareholders and creditors.

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Invited Article ; Accepted November 2003 under Memorandum of Understanding (MOU) signed in 2003

The conflict of interests between shareholders and creditors is a widely cited impediment to debt financing. For instance, agency and option theories predict that more leverage induces managers, acting in the best interest of shareholders, to take more risk.[1] Accordingly, rational creditors anticipate this opportunistic behavior and discount the price of debt at issuance. In turn, shareholders' opportunistic behavior results in lower ex-ante debt ratios. However, to some extent, there is weak empirical evidence of the debt-induced risk-taking incentive. For instance, Parrino and Weisbach (1999) conduct simulation analysis for a typical firm in Compustat and conclude that the magnitude of risk-taking is too small to explain cross-sectional variations in debt ratios. Since the magnitude of conflicts of interests between shareholders and creditors is likely to be more pronounced in financial distress (Brealey and Myers, 1996), some authors investigate the risk-taking behavior of financially distressed firms. Andrade and Kaplan (1998) document that highly leveraged firms that became financially distressed do not undertake high-risk projects. Aharony et al. (1980) and Johnson (1989) find no significant statistical difference between the systematic risk of financially distressed firms and the systematic risk of comparable healthy firms. Finally, Altman and Brenner (1981) find that the systematic risk of financially distressed firms decreases as bankruptcy approaches.

The objective of this paper is to provide a rationale for the previously documented risk-taking behavior of highly leveraged firms. I selected a sample of Canadian financially distressed firms (distressed sample) and a size- and industry-matched sample of healthy firms (control sample). The results show that the level of risk-taking is similar across the two samples. Consistent with previous empirical studies, this suggests that high leverage do not induce firms to take more risk. Further investigations relate the observed level of risk-taking to ownership structure variables and other observable firm characteristics. For the distressed sample, the results indicate that, in contrast to the control sample, managers and blockholders exhibit risk aversion, while institutional investors are risk-neutral. In addition, hedging, the convexity of the tax function, firm size, and, to a lower extent, the presence of growth opportunities mitigate risk-taking. Overall, the results suggest that conflicts of interests between shareholders and creditors are not exacerbated in financial distress and that the incentive to take more risk implied by a high leverage is offset by other factors such as ownership structure, hedging, taxes, asset size, and asset structure. In the light of the results, it seems that excessive ex-post risk-taking is not related to the observed low debt ratios.

This article is organized as follows. Section I discusses the literature on the determinants of corporate risk-taking and develops testable hypotheses. Section II describes sample selection and variables, while Section III presents the empirical models. Section IV reports the results and Section V concludes the paper.

II. Literature review and testable hypotheses

2.1. *Ownership structure*

2.1.1. *Managers*

Agency and option theories predict that debt financing provides shareholders with an incentive to shift to high-risk projects, since in doing so they expropriate wealth from creditors. This prediction is based, however, on the premise that managers are acting in the best interest of shareholders. Yet, managers do not always have interests that coincide with those of outside shareholders, a factor which apparently affects firm's risk-taking behavior. Managers have their reputation and human capital invested in the firm. Likewise, they may derive private benefits that are not shared with other shareholders (e.g., perquisites consumption). These factors would make managers more concerned with firm survival instead of firm performance. Therefore, in contrast to atomistic outside shareholders, managers are likely to prefer low (or at least stable) risk-taking strategies. Standard agency literature (Jensen and Meckling, 1976) suggests that increasing managerial stock holdings help align managerial interests with those of outside shareholders. Consequently, one might expect that managers are prone to take on more risk as their shareholding increases. However, some authors point out that, beyond a certain ownership level, managers may become entrenched as their high ownership enables them to resist hostile takeovers (Stulz, 1988). Furthermore, as their ownership increases, managers may hold an undiversified portfolio. Hence, I hypothesize that the relationship between risk-taking and managerial ownership is not monotonic: It increases at low levels of managerial ownership and decreases at high levels of managerial ownership.

Financial distress is a critical situation for managers. If the firm goes bankrupt, managers' reputation and firm-specific human capital are seriously damaged, their private benefits (if any) are lost, and their ownership stakes are nearly worthless.[2] Therefore, I expect that managers exhibit more risk-aversion in financial distress, since increasing risk (that increases the likelihood of bankruptcy) is harmful to their firm-specific relationship.

2.1.2. *Large shareholders*

If the ownership structure of the firm is diffused, an atomistic shareholder would have no incentives to monitor risk-averse managers, since he supports the full cost of such monitoring and shares the potential benefits with other shareholders. However, if ownership structure is concentrated, a large shareholder such as a blockholder or an institutional investor could internalize monitoring costs to insure an adequate return on his (significant) investment. Moreover, a large shareholder has generally sufficient voting rights to dictate corporate policy through board representation, votes in the annual meetings, etc. Therefore, large shareholders have the incentives and ability to force managers to alter their preferences toward more risky strategies.

However, an increase in risk may be detrimental to large shareholders. For instance, if a blockholder generates private benefits of control (i.e., benefits not shared with other shareholders), a risk aggressive strategy may lead to bankruptcy and the loss of such private benefits. Risk-aversion by blockholders is likely be greater in financial distress, since at that stage the probability of losing private benefits is higher. Moreover, blockholders may be under-diversified investors (Demsetz and Lehn, 1985) and prefer not to increase the riskiness of their investments. Dichev (1998) finds that the risk of bankruptcy is not idiosyncratic. Since the risk of bankruptcy is higher in financial distress, one might expect the cost of under-diversification to be greater at that stage and blockholders to exhibit more risk-aversion.

Institutional investors may also be reluctant to promote risk-aggressive strategies. For instance, fund managers are evaluated on a quarterly basis. Therefore, they are likely to adopt short-horizon investments and be unwilling to promote long-term, high-risk corporate projects. In addition, institutional investors must comply with prudent-man laws. Prudent-man laws are enacted to allow beneficiaries to seek damages from a fiduciary that fails to invest in their best interests. Del Guercio (1996) argues that what the courts accept as a prudent investment has been based primarily on the characteristics of the asset in isolation and ignores the role an asset plays in overall portfolio. Therefore, increased risk may be harmful to institutional investors subject to prudent-man laws. This is especially the case in financial distress since high risk increases the probability of bankruptcy and in turn the possibility of lawsuit filings by the institution's shareholders.

In the light of the previous discussion, the effect of the presence of a large shareholder on corporate risk-taking is ambiguous. On the one hand, large shareholders have the necessary voting rights to monitor and force risk-averse managers to increase risk. On the other, a risk-increasing strategy may expose them to adverse effects. Therefore, I assume that the impact of a large shareholder on risk-taking is an empirical issue.

2.2. *Asset structure*

Corporate assets are composed of assets in place and growth opportunities. A given increase in risk will have a different impact on each asset type. Assets in place are generally valued according to discounted cash flows methods. Thus, *ceteris paribus*, an increase in risk will lower their expected value (through an increase of the discount rate). On the other hand, growth opportunities are valued as real options. Since increases in the risk of the underlying asset boost option values, the expected value of growth opportunities will increase with risk. Therefore, one might expect firms whose asset structures are dominated by growth opportunities to take more risk than others whose asset structures are dominated by assets in place.

However, this argument may be reversed when a firm is running into financial difficulties. Shleifer and Vishny (1992) build a model in which

a distressed firm is forced to liquidate its assets. Asset liquidity plays an important role for the price the firm will receive. Illiquid, firm specific assets are harder to sell since "optimal buyers" (those that are in the same industry as the seller) are likely to experience financial difficulties too. Therefore, the firm will be obliged to sell to "second-best buyers" (industry outsiders) at a large discount.[3] As argued by Myers (1977), growth opportunities are generally firm specific (as they are related to assets in place or result from the firm's experience curve) and trade in thin, restricted, and imperfect secondary markets. Thus, growth opportunities fit naturally in the Shleifer and Vishny problem. Excessive risk-taking by a high-growth firm will increase the probability of liquidation, i.e., the probability that the firm will sell its growth opportunities at a large discount. Hence, I expect that in financial distress, high-growth firms will take less risk to preserve the ongoing-concern value of their growth prospects.

2.3. *Hedging*

Hedging is the process by which a firm reduces the volatility of its future cash flows using derivative securities. In a frictionless Modigliani and Miller world, a firm has no incentives to hedge since its shareholders could replicate the hedging strategy at no cost. However, real world imperfections such as financial distress and bankruptcy costs, transaction costs, and asymmetric information could make corporate hedging value relevant. For instance, Smith and Stulz (1985) argue that financial distress and bankruptcy costs are positively related to future cash flows variability. They suggest that, by hedging future cash flows and thus decreasing financial distress and bankruptcy costs, a firm could enhance its value. Moreover, a firm is likely to face frictions when it raises funds in capital markets. Transaction costs and asymmetric information could make external funds costly, and, in extreme cases inaccessible. Hence, internally generated funds have a cost advantage over external funds. Froot et al. (1993) argue that hedging creates an internal capital market by stabilizing a firm's future cash flow stream and limits the need for costly external finance.

Risk reduction through hedging may enhance firm value especially when a firm is facing market imperfections. Market imperfections are likely to be higher in financial distress (Gilson, 1997). Thus, I expect financially distressed firms to hedge extensively and reduce risk.

2.4. *Taxes*

Smith and Stulz (1985) show that, by reducing risk, a firm is able to achieve tax savings. A necessary and sufficient condition for tax savings is the convexity of the tax function. The latter arises from several tax code provisions such as the asymmetric treatment of profits and losses, statutory tax rate progressivity, investment tax credits, tax loss carrybacks and carryforwards, foreign tax credits, etc. The convexity of the tax function means that the marginal tax rate is an increasing function of taxable income: higher income is more heavily taxed than lower income. A risk reducing strategy implies that highly expected incomes are decreased, and

low expected incomes are increased. In a context of a convex tax function, the tax gain from reducing highly expected incomes outweighs the tax loss from increasing low expected incomes, leading to a net tax gain (see appendix 1 for a more formal illustration).

Using simulation analysis, Graham and Smith (1999) show that, reducing the volatility of future income by 5% leads to an average tax saving of 5.4% for a typical firm. The authors also identify firms that are likely to have convex tax functions. These firms are those that exhibit volatile, negatively correlated, and near zero taxable income. These characteristics are more likely to fit financially distressed than healthy firms. Therefore, I expect that financially distressed firms are more likely to reduce the risk of their future cash flows to achieve tax savings.

2.5. *Absolute priority rule violation*

The Absolute priority rule (APR) states that, in the event of bankruptcy, creditors must be paid before shareholders receive any portion of the firm's asset value. Therefore, valuing shareholders' equity as a call option on corporate assets with a strike price equal to the face value of debt is a direct consequence of the APR. Accordingly, the APR lies at the hart of the risk-taking incentive implied by debt financing. Eberhart and Senbet (1993) show that violations of the APR (i.e., allowing shareholders to receive a fraction of assets value even when creditors are not fully paid) mitigate the risk-taking incentive, especially for financially distressed firms.[4] This happens because shareholders' equity can no longer be viewed as a call option. Weiss (1990) finds that the probability of APR violation is increasing in firm size. Therefore, I expect larger firms to take on less risk than smaller firms.

III. Sample selection and variables

3.1. *Sample selection*

In this paper, I examine the risk-taking behavior of financially distressed and comparable healthy firms. The sampling procedure is summarized in Figure 1. I select financially distressed firms according to their interest coverage ratio (i.e., the ratio of earnings before interest and taxes over interest expenses). I assume that a given firm is financially distressed if its interest coverage ratio (ICR) is lower than one (i.e., current cash flows are not sufficient to pay interest charges). To be included into the financially distressed sample, a firm must exhibit an ICR lower than one in year *t*, but no history of financial distress in the two previous years (i.e., ICR is higher than one in year *t-1* and *t-2*).[5] I apply the previous procedure to Canadian listed firms (excluding those from the financial sector) reported in the StockGuide database over the 1996-1998 period. I end up with 142 financially distressed firms.

To construct a control sample of healthy firms, I determine firms that had an ICR higher than one during year *t-2*, *t-1* and *t*. For each firm included in the financially distressed sample, I associate a healthy firm in the same industry with the closest total assets. The control sample comprises 110 firms.[6]

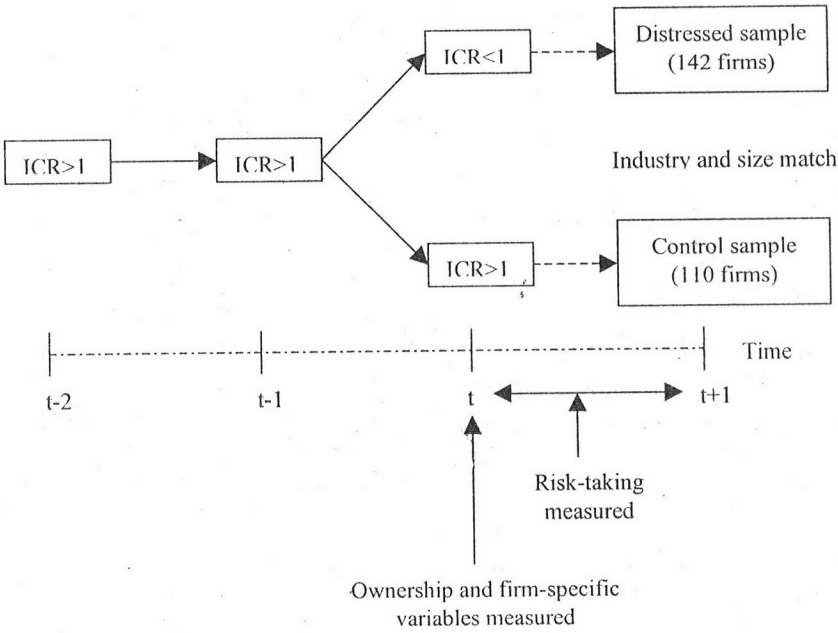


Figure 1

3.2. *Variables*

3.2.1. *Risk-taking*

I use the asset volatility derived from option-pricing theory as a proxy for risk-taking. Suppose that the value of a firm's assets, V_a, follows a geometric Brownian motion:

$$dV_a = \mu V_a dt + \sigma_a V_a dz, \tag{1}$$

where, μ is the growth rate of assets,
σ_a is the volatility of assets, and
dz is a standard Wiener process.

Assume that shareholders' equity is a call option on a firm's assets with a strike price equal to the face value of debt, then,

$$V_e = V_a N(d_1) + e^{-rT} BN(d_2), \tag{2}$$

where, V_e is the value of shareholders' equity,
B is the face value of debt,
r is the risk-free rate,

$$d_1 = \frac{\ln(V_a / B) + (r + \sigma_a^2 / 2)T}{\sigma_a \sqrt{T}},$$

$d_2 = d_1 - \sigma_a\sqrt{T}$, T is debt maturity, and

$N(.)$ is the cumulative normal distribution function.

Using Ito's Lemma, one can derive an expression for assets volatility:

$$\sigma_a = \frac{\sigma_e V_e}{V_a N(d_1)}, \quad (3)$$

where, σ_e is the volatility of shareholders' equity.

Now suppose that the debt is a perpetuity (i.e. $T \to +\infty$)[7], then the term $N(d_1)$ converges to one, and the previous equation is reduced to

$$\sigma_a = \sigma_e \frac{V_e}{V_a} \quad (4)$$

The preceding expression is no other than the volatility of shareholders' equity adjusted for the capital structure of the firm.[8] In my analysis, risk-taking is the dependent variable. To attenuate the potential effect of risk-taking on the vector of explanatory variables (the simultaneity bias), I measure the former during year *t+1* and the latter at the end of year t. I gather daily stock returns during year *t+1* from the TSE Western database. To calculate assets volatility, I multiply the annualized volatility of stock returns by the ratio of market value of equity (price per share times the number of shares outstanding at the beginning of year *t+1*) to the market value of assets (market value of equity plus the book value of total debt at the beginning of year *t+1*).

3.2.2. *Ownership structure variables*

I gather manually the following ownership variables from proxy circulars in the Sedar database. Managerial ownership is defined as the fractional ownership of directors and officers as a group. Block ownership (Institutional ownership) is defined as the sum of fractional ownership by individuals or corporations (institutional investors), holding more than 10% of shares outstanding.[9] It happens that an individual or a corporation vote in the annual meeting on behalf of a group of minority shareholders. I define the variable dispersed block as the sum of fractional minority ownership represented in the annual meeting by a single entity. In my analysis, this variable is interesting because, like large shareholders, it carries important voting rights to exercise effective monitoring, but do not derive private benefits nor support underdiversification costs. Therefore, it is well suited to disentangle the monitoring effect from the private benefits and under-diversification effect of concentrated ownership on risk-taking.

3.2.3. *Other firm-specific variables*

I use the market-to-book ratio as a proxy for growth opportunities. The market-to-book ratio is defined as the ratio of the market value of assets over the book value of assets at fiscal year end. I consulted annual reports to obtain information on corporate derivative usage. I construct a dummy variable, which equals one when the firm reports that it uses futures contracts, options, or swaps to hedge its future cash flows, and zero otherwise. To measure tax function convexity, I use the average tax rate defined as the ratio of tax paid over earnings before tax. Finally, I employ the natural logarithm of market value of assets as a proxy for size.

IV. Empirical models

First, I investigate the association between corporate risk-taking and ownership structure. Since I have assumed that the relationship between risk-taking and managerial ownership is not monotonic, I employ a piecewise regression. Let k be a managerial ownership breakpoint. Then, I define the two following variables.

$$\text{Low Managerial ownership} = \begin{cases} \text{managerial ownership if managerial ownership} < k; \\ = \text{breakpoint, if managerial ownership} \geq k. \end{cases}$$

$$\text{High managerial ownership} = \begin{cases} 0, \text{ if managerial ownership} < k; \\ = \text{managerial ownership–breakpoint, if managerial ownership} \geq k. \end{cases}$$

The first regression is:

$$\text{Risk-taking} = f(\text{Year dummies, Natural resources dummy, Low managerial ownership, High managerial ownership, Block ownership, Dispersed ownership, Institutional ownership, Size}),$$

where, the logarithm of assets volatility is the proxy for risk-taking.[10]

To estimate the managerial ownership breakpoint k, I follow the procedure employed by Cho (1998). First, I search for an initial managerial ownership level, starting at 0%, that maximizes the slope coefficient on the low managerial ownership variable. Then, I use an iterated search technique around this ownership level to find the breakpoint that produces simultaneously the most significant slope coefficients on the low managerial and high managerial ownership variables.

The second regression includes ownership and other firm specific variables. Since Graham and Smith (1999) found that firms having taxable incomes near zero are likely to face tax function convexity, I define the three following variables based on the distribution of the average tax rate, where T1 and T2 are the 33%, and 66% percentiles respectively.

Low average tax rate = average tax rate, if average tax rate < T1;
= T1, if average tax rate ≥ T1;

Intermediate average tax rate = 0, if average tax rate < T1;
= average tax rate – T1, if T1 ≤ average tax rate < T2;
= T2, if average tax rate ≥ T2;

High average tax rate = 0, if average tax rate < T2;
= average tax rate – T2, if average tax rate ≥ T2.

I expect the intermediate average tax rate variable to gauge tax function convexity, and, consequently to negatively affect corporate risk-taking. The second regression is:

Risk-taking = *f* (Year dummies, natural resources dummy, ownership structure variables, market-to-book, hedge, low average tax rate, intermediate average tax rate, high average tax rate, Size).

In a third regression, I focus more closely on the relationship between growth opportunities and corporate risk-taking. Since this relationship is likely to be different for low growth and high growth firms, I define the two following variables.

Low market-to-book = market-to-book, if market-to-book < 1;
= 1, if market-to-book ≥ 1.

High market-to-book = 0, if market-to-book < 1;
= market-to-book –1, if market-to-book ≥ 1

The third regression is:

Risk-taking = *f* (Year dummies, natural resources dummy, ownership structure variables, low market-to-book, high hedge, low market-to-book, average tax rate, intermediate average tax rate, high average tax rate, size).

V. Results

5.1. *Univariate results*

Table I reports descriptive statistics for each variable used in this study (mean, median, and standard deviation) along with Wilcoxon statistics for differences in medians across the two samples. I have also introduced three supplementary variables to test the robustness of the sampling procedure. These variables are total assets and two versions of the leverage ratio. The first version is book leverage defined as the ratio of total debt over the book value of assets. The second version is market leverage defined as the ratio of total debt over the market value of assets. There is no significant statistical difference between median total assets

across the two samples. This suggests that firm-by-firm matching procedure is robust. The two versions of the leverage ratio are significantly higher in the distressed sample than in the control sample. This implies that the ICR ratio is quite effective in selecting financially distressed firms.

Table I
Descriptive statistics

	Distressed sample (N=142)			Control sample (N=110)			
	Mean	Median	Standard deviation	Mean	Median	Standard deviation	Difference in medians (Wilcoxon)
Assets volatility	0.43	0.35	0.34	0.42	0.31	0.59	-1.21
Managerial ownership (%)	22.38	13.88	22.84	25.89	18.06	23.85	1.28
Block ownership (%)	24.97	17.23	24.17	25.22	18.33	25.63	-0.04
Dispersed ownership (%)	5.89	0.00	18.61	5.62	0.00	17.74	0.17
Institutional ownership (%)	5.09	0.00	9.97	4.60	0.00	10.88	-0.71
Market-to-book	1.14	1.02	0.49	2.46	1.21	7.15	**4.23**[a]
Hedge	0.66	1.00	0.48	0.57	1.00	0.50	-1.54
Average tax rate	9.30	11.81	76.80	47.04	36.71	97.95	**6.62**[a]
Market value of assets	923164	140483	1760980	1115927	184959	2308390	1.42
Book value of assets	977983	977444	2006548	926417	107551	2122271	0.09
Book leverage	0.48	0.49	0.21	0.34	0.32	0.21	**-4.84**[a]
Market leverage	0.48	0.48	0.18	0.41	0.42	0.18	**-2.69**[a]

Note : This table shows the mean, median, and standard deviation of all variables used in this study along with Wilcoxon statistics for differences in medians across two samples of financially distressed and healthy firms. Assets volatility is the product of the annualized volatility of stock returns during year t+1, and the ratio of market value of equity (price per share times the number of shares outstanding at the beginning of year t+1) to the market value of assets (market value of equity plus the book value of total debt at the beginning of year t+1). Managerial ownership is the fractional ownership of directors and officers as a group. Block ownership (institutional ownership) is defined as the sum of fractional ownership by individuals or corporations (institutional investors), holding more than 10% of shares outstanding. Dispersed block is the sum of fractional minority ownership represented in the annual meeting by a single entity. All ownership variables are expressed in percentages. The market-to-book ratio is the ratio of the market value of assets over the book value of assets at fiscal year end. Hedge is a dummy variable, which equals one when the firm reports that it uses futures contracts, options, or swaps to hedge its future cash flows, and zero otherwise. The average tax rate is the ratio of tax paid over earnings before tax. Size is the natural logarithm of the market value of assets. Total assets are expressed in thousands of dollars. Book leverage is the ratio of total debt over the book value of assets. Market leverage is the ratio of total debt over the market value of assets. a, b, and c denote statistical significance at the 1%, 5%, and 10% respectively.

5.2. *Multivariate results*

Regression results for the distressed and control sample are presented in Table II. The F-statistic shows that all regressions are significant at the 1% level. The adjusted R-square varies between 80% and 89%. This indicates that the explanatory variables are effective in explaining variations in the risk-taking behavior of sample firms. The coefficients of year dummies (not reported) are all positive, but significant only in the distressed sample, which suggests that changing macroeconomic conditions play a role in determining corporate risk-taking in financial distress.

Table II
Determinants of corporate risk-taking

	Distressed sample (N=142)			Control sample (N=110)		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Natural resources dummy	**0.421**[a]	**0.391**[a]	**0.311**[a]	-0.361	-0.466	-0.312
	(0.006)	**(0.01)**	**(0.01)**	(0.351)	(0.412)	(0.412)
Low managerial ownership	0.074	0.055	0.112	**0.09**[b]	**0.105**[b]	**0.125**[c]
	(0.354)	(0.241)	(0.154)	**(0.015)**	**(0.050)**	**(0.071)**
High managerial ownership	**-0.048**[a]	**-0.067**[a]	**-0.125**[a]	-0.075	-0.111	-0.093
	(0.001)	**(0.005)**	**(0.003)**	(0.269)	(0.365)	(0.419)
Block ownership	**-0.066**[a]	**-0.045**[b]	**-0.075**[b]	0.112	0.123	0.09
	(0.01)	**(0.015)**	**(0.012)**	(0.154)	(0.213)	(0.237)
Dispersed block ownership	-0.001	-0.001	-0.001	**0.014**[c]	**0.011**[c]	**0.013**[c]
	(0.874)	(0.742)	(0.851)	**(0.084)**	**(0.074)**	**(0.079)**
Institutional ownership	0.05	0.05	0.06	**0.035**[b]	**0.031**[b]	**0.036**[b]
	(0.365)	(0.245)	(0.267)	**(0.031)**	**(0.021)**	**(0.029)**
Hedge		**-0.151**[c]	**-0.251**[c]		-0.154	-0.196
		(0.081)	**(0.096)**		(0.125)	(0.148)
Low average tax rate		0.001	0.001		-0.021	-0.022
		(0.423)	(0.465)		(0.235)	(0.258)
Intermediate average tax rate		**-0.012**[b]	**-0.013**[b]		-0.002	-0.002
		(0.034)	**(0.042)**		(0.349)	(0.333)
High average tax rate		0.001	0.001		-0.001	-0.001
		(0.742)	(0.756)		(0.841)	(0.853)
Market-to-book		**0.251**[b]			**0.102**[c]	
		(0.012)			(0.051)	
Low market-to-book			**1.201**[b]			-0.051
			(0.015)			(0.471)
High market-to-book			**0.214**[a]			**0.112**[c]
			(0.001)			(0.056)
Size	**-0.189**[a]	**-0.199**[a]	**-0.206**[a]	0.015	0.013	0.015
	(0.001)	**(0.001)**	**(0.001)**	(0.753)	(0.732)	(0.841)
Adjusted R^2	0.80	0.82	0.86	0.84	0.83	0.89
F test	**80.23**[a]	**85.65**[a]	**89.12**[a]	**27.84**[a]	**29.36**[a]	**26.87**[a]
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Breakpoint	15%	15%	15%	12.5%	12.5%	12.5%

Note : This Table reports the results of regressions of the logarithm of assets volatility on year dummies, industry dummy, ownership structure and other observable firm-specific variables. Assets volatility is the product of the annualized volatility of stock returns during year *t+1*, and the ratio of market value of equity (price per share times the number of shares outstanding at the beginning of year *t+1*) to the market value of assets (market value of equity plus the book value of total debt at the beginning of year *t+1*). Managerial ownership is the fractional ownership of directors and officers as a group. Block ownership (institutional ownership) is defined as the sum of fractional ownership by individuals or corporations (institutional investors), holding more than 10% of shares outstanding. Dispersed block is the sum of fractional minority ownership represented in the annual meeting by a single entity. The market-to-book ratio is the ratio of the market value of assets over the book value of assets at fiscal year end. Hedge is a dummy variable, which equals one when the firm reports that it uses futures contracts, options, or swaps to hedge its future cash flows, and zero otherwise. The average tax rate is the ratio of tax paid over earnings before tax. Size is the natural logarithm of the market value of assets. P-values are between parentheses. a, b, and c denote statistical significance at the 1%, 5%, and 10% respectively.

The results of the first regression are reported in columns two and four. The estimated managerial breakpoint is 15% for the distressed sample and 12.5% for the control sample. The hypothesis that the risk-taking managerial ownership relationship is not monotonic is confirmed. For the control sample, the managerial ownership coefficient is significantly positive up to the 12.5% breakpoint, but negative (and not significant) beyond. For the distressed sample, this coefficient is positive (and not significant) until the 15% break point, but significantly negative beyond. A plausible interpretation of these results is the following. For the control sample, increased managerial ownership until the 15% level contributes to aligning the interests of managers and shareholders and reducing managerial risk-aversion. However, beyond the 15% breakpoint, increased managerial ownership has two opposing effects on risk-taking: a positive effect related to the alignment of interests with shareholders, and a negative effect due to the managers insulated from the takeover market and holding undiversified portfolios. Beyond the 15% level, the two effects offset each other and managerial ownership has no significant influence on risk-taking. For the distressed sample, increased managerial ownership until the 12.5% level has no significant effect on risk-taking. The alignment of interests at low levels of managerial ownership in the control sample does not work out in the financially distressed sample. This can be explained by the fact that, at low levels of managerial ownership, managers may be concerned with their reputation, firm-specific human capital, and perquisites consumption that are at risk in financial distress. Beyond the 12.5% level, managerial ownership has a negative effect on risk-taking. The entrenchment effect is predominant in financial distress. Managers reduce risk because they want to preserve their jobs and face higher costs of undiversification.

The block ownership coefficient is positive but not statistically significant in the control sample, while it is significantly negative in the financially distressed sample. This finding indicates that blockholders of financially distressed firms are risk-averse investors. The potential causes of blockholders' risk-aversion in financial distress are the greater probability of losing private benefits of control and higher costs of under-diversification. The results also suggest that, in financial distress, large blockholders do not play a monitoring role to discipline risk-averse managers. Further evidence comes from the dispersed block ownership variable. I have argued that the coalition of minority shareholders, unlike blockholders, neither procures private benefits of control nor faces under-diversification costs. However, it may play a monitoring role arising from the importance of its voting rights. Therefore, the differential impact of blockholders and the coalition of minority shareholders on risk-taking are likely to be the consequence of private benefits of control and under-diversification costs. Interestingly, the coefficient of the dispersed block ownership variable is positive and significant in the control sample, but negative and not significant in the financially distressed sample. This result suggests that the monitoring role of concentrated block ownership is effective only in

good times and not in financial distress. Overall, the results suggest that, in financial distress, the fear of losing private benefits of control and greater under-diversification costs drive blockholders to act in a risk-averse manner.

The institutional ownership coefficient is positive and significant in the control sample, but positive and not significant in the financially distressed sample. Hence, it seems that monitoring of risk-averse managers by institutional investors is only effective in good times. In financial distress, institutional investors do not encourage managers to promote risk-taking. This is likely because institutions fear lawsuit filings by their shareholders under prudent-man laws and/or because they adopt shorter horizon investments.

The results of the second regression are reported in columns three and five. The coefficient of the hedge dummy variable is negative in the two samples, but is significant only in the financially distressed sample. This finding confirms the hypothesis that financially distressed firms encounter more market imperfections, and that they reduce imperfections by reducing risk using derivative instruments.

The coefficients of the three tax variables are negative but not significant in the control sample. However, in the financially distressed sample, the coefficient of the intermediate average tax rate variable is negative and highly significant. Since firms having taxable incomes near zero are likely to have convex tax functions, this result is consistent with tax function convexity inducing firms to lower the risk of their cash flows. This holds only in the distressed sample, suggesting that financially distressed firms achieve tax savings by reducing risk.

The market-to-book ratio positively and significantly affects corporate risk-taking in both samples. The positive association between growth opportunities and risk-taking is likely to be due to the option-like characteristics of growth opportunities. In the third regression, I employ a piecewise linear specification of the market-to-book ratio to further explore the impact of the presence vs. absence of growth opportunities on risk-taking. In the control sample, only the high market-to-book ratio variable has a significant (positive) influence on risk-taking. In the financially distressed sample, the low and high market-to-book ratio variables positively and significantly affect risk-taking. However, the magnitude of the high market-to-book coefficient is smaller than the low market-to-book coefficient (1.201 vs 0.214). That is, in financial distress, high growth firms have fewer tendencies to take risk than low growth firms. This result is consistent with the argument that increased risk-taking is harmful to the ongoing-concern value of growth firms, i.e., increased risk increases the odds that the firm will depart from its growth opportunities at a substantial discount.

Firm size has no significant effect on risk-taking in the control sample while it has a negative and significant effect in the financially distressed sample. As discussed earlier, APR violations mitigate the risk-taking

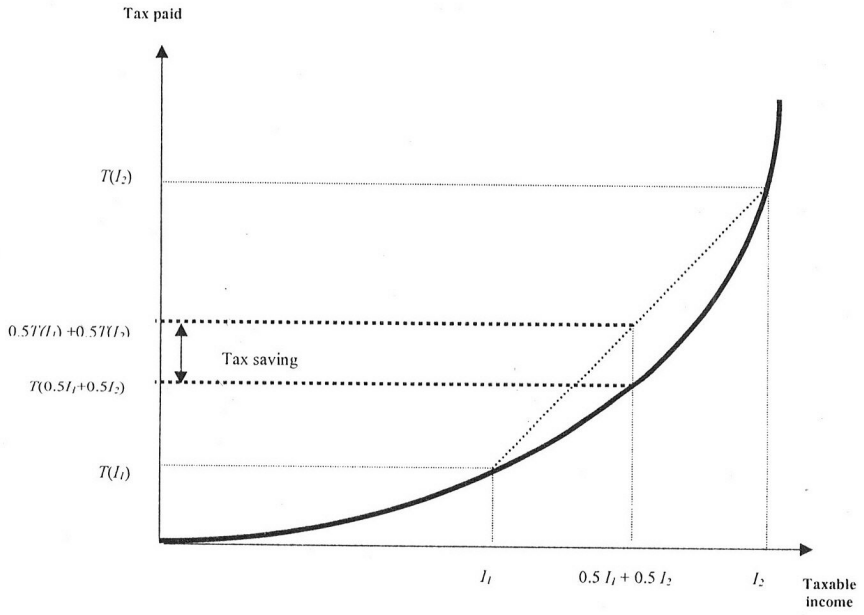
incentive of leveraged firms. Therefore, the result is consistent with the likelihood of APR violation increasing in firm size (Weiss, 1990).

VI. Conclusion

Agency and option theories predict that leverage provides a firm's shareholders with an incentive to shift to high-risk projects since, in doing so, they expropriate wealth from creditors. This conflict of interests between creditors and shareholders has been acknowledged as a serious impediment to debt financing. In this paper, I investigate the risk-taking incentive of a highly leveraged, financially distressed sample and a healthy, control sample. Consistent with previous empirical literature, I do not find a significant difference in risk-taking across the two samples. Since financially distressed firms do not take on more risk than comparable healthy firms, the risk-taking incentive cannot be addressed as an impediment to debt financing. In regression analysis, I explore why financially distressed firms do not take more risk as predicted by agency and option theories. The results are consistent with managers and blockholders acting in a risk-averse manner. A potential explanation for these results is that increasing risk exposes managers and blockholders to significant costs. The costs of increased risk are lost jobs, reputation, perquisites, and firm-specific human capital for managers and, under-diversification costs and lost private benefits of control for blockholders. In addition, institutional investors do not promote corporate risk-taking presumably because of short horizon investments and the fear of lawsuit filings under 'prudent-man laws'. The results are also consistent with financially distressed firms reducing risk (1) through hedging instruments to lessen market imperfections, (2) to achieve tax savings, (3) to preserve the going-concern value of growth opportunities, and (4) because they anticipate absolute priority rule violations. Overall, the results of this paper suggest that the risk-taking incentive provided by leverage is counterbalanced by risk reducing incentives implied by other factors such as ownership structure, hedging, taxes, asset structure, and size.

Appendix

- Consider a firm F with a convex tax function, $T(.)$, plotted in figure 2. Suppose that F has the following income distribution: I_1 with probability ½, and I_2 with probability ½, where $I_1 < I_2$. Therefore, the expected income is $0.5\ I_1 + 0.5\ I_2$ and the expected tax to be paid is $0.5\ T(I_1) + 0.5\ T(I_2)$.
- Now, suppose that F completely eliminates the uncertainty in its income distribution. The expected income is always $0.5\ I_1 + 0.5\ I_2$. However, the expected tax to be paid become $T[0.5\ I_1 + 0.5\ I_2]$.
- From the figure (and Jensen inequality), it is clear that $0.5\ T(I_1) + 0.5\ T(I_2) > T[0.5\ I_1 + 0.5\ I_2]$. Therefore, Firm F could achieve a tax saving of $0.5\ T(I_1) + 0.5\ T(I_2) - T[0.5\ I_1 + 0.5\ I_2]$ if it completely reduces the risk of its income distribution. A more rigorous proof shows that the magnitude of tax saving is increasing in the convexity of the tax function and the volatility of income distribution.



Notes

1. Agency theory predicts that debt financing provides shareholders with an incentive to transfer wealth from creditors to themselves by shifting to high-risk projects (Jensen and Meckling, 1976; Myers, 1977). Furthermore, shareholders' equity may be viewed as a call option on firm's assets with a strike price equal to the face value of debt. Call option value increases as the risk of the underlying asset increases. Hence, option theory predicts that shareholders benefit from increasing the riskiness of their firm's assets.
2. Gilson (1989) notice that managers of bankrupt firms have higher turnover rates than managers of a comparable sample of healthy firms. In addition, when they are dismissed, they are less likely to be hired by another firm. These findings suggest that bankruptcy is harmful to the reputation, human capital, and private benefits of managers.
3. See Pulvino (1998) and Kruse (2002) for an empirical evidence of the Shleifer and Vishny (1992) model.

4. There are other means to mitigate the risk-taking incentive of leveraged firms issuing convertible and callable debt. Eberhart and Senbet (1993) show that while these means alter the structure of shareholder payoff, these are ineffective in financial distress since the convertible and call provisions are nearly worthless at that time.
5. I focus on the early stages of financial distress for several reasons. First, because Altman (1983, p. 518) argue that "I am not persuaded that managers increase their risk-taking as bankruptcy approaches... It is usually the abnormal risks that are taken long before bankruptcy is apparent that are the fundamental causes of failure-not what occurs as the market perceives the bankruptcy risk more clearly. "By focusing on the first year of financial distress, my proxy for risk-taking will be clean of any measurement error related to abnormal risks taken before bankruptcy. Second, some authors note that stocks of firms that are in advanced stages of financial distress trade infrequently (Ro et al, 1992). Therefore, in advanced stages of financial distress, any risk-taking estimate based on the volatility of stock prices will be downward biased. An indepth examination of my sample firms shows that the pattern of trading is similar in the financially distressed and control sample. Third, it is shown that the stock price decreases significantly near bankruptcy because of asymmetric information costs (Johnson, 1989). In turn, this would make the interpretation of proxies for growth opportunities (e.g. the market-to-book ratio) very difficult.
6. The number of observations is lower in the control sample than in the distressed sample because it happens that a firm in the control sample is associated with more than one firm in the distressed sample.
7. This hypothesis is made to facilitate the calculation of assets volatility, since StockGuide does not provide data on debt maturity.
8. Therefore, it is not necessary to include the leverage ratio as an explanatory variable in assets volatility regressions.
9. Canadian listed firms are required to disclose the ownership of large shareholders when it is greater than 10% of outstanding shares. This is higher than the 5% threshold in the U.S.
10. Since my sample observations come from the 1996-1998 period, I include year dummies in the regressions to control for the effect of time-varying macroeconomic conditions on risk-taking. Moreover, the Canadian economy is dominated by the natural resources sector, which is reflected in my samples. Therefore, I include a natural resources dummy in my regressions to control for any industry specific effect on risk-taking.

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